# CHAPTER X

## CONSTRUCTION

The Command's construction program (Program IV), was responsible for the effective execution, through Naval Facilities Engineering Command field offices, of Congressionally authorized and funded engineering and construction projects contained in the Navy and Naval Reserve Military Construction Programs (MCON and MCNR). Additionally, the Command was responsible for the execution of any other approved engineering and construction programs that were assigned to it for execution. This included multi-service construction programs for contingency operations.

The Command's responsibilities included the planning, coordination and execution of architectural and engineering services and actual construction (excluding utilities and research and development), the provision of architectural and engineering and construction contract management assistance, and the control and management of Command capabilities, at both Headquarters and field levels. The Command was also responsible for contract engineering and construction execution along with the related manpower, money and other resources which were assigned. The Command served as construction execution agent for the Departments of the Army and Air Force, and other defense agencies and offices, the Agency for International Development, the State Department and other federal

and civilian agencies as requested. The Command was further responsible for project and program management, and quality control of all facilities constructed under the naval and reserve military construction programs, including the facilities portion of shore electronics (which encompassed the provision of electronics engineerings and technical guidance on all naval shore electronics projects). These responsibilities also extended to facilities for the Navy and Marine air, medical, personnel, ordnance, supply, research and family housing and included program management and coordination of multi-service Southeast Asia contract construction programs. A major role was also played in assisting the development and the provision of technical guidance for the planning, programming, design, construction and installation of facilities. This included coordination with higher authorities in the Offices of the Chief of Naval Operations, the Chief of Naval Material, the Secretary of the Navy and the Secretary of Defense. Finally the Command, through the Construction Program, had responsibility for the formulation, development and implementation of the Construction Quality Control Assurance Program and related construction engineering programs.[1]

The Command's overall construction policies during the period under consideration were embodied in the Operating Plans (fiscal years 1966-1971) and their successors, the Command Management Plans

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[1]Headquarters Organization Manual, NAVFAC P-313, Change 76 (NAVFAC Notice 5450 of 2 Dec 1974), p. 05-03.

(fiscal years 1972-1975). These annually released documents specified construction (Program IV) goals, and objectives. The information found therein, while general in nature, provides valuable insight into those areas that the Command wished emphasized.

In fiscal year 1966, the Command was concerned with achieving three major construction goals: (1) improve construction program planning[2] (2) improve construction execution and (3) provide sound management to the construction programs. To implement the first of these the Command called for the completion of the maximum number of program cost estimates by 1 October 1965, the obtaining of 100 percent of architectural and engineering contracts for housing plans and specifications, and the completion of optimum plans and specifications by the apportionment date. To achieve the second major goal the Command required that the Construction Program obtain the maximum number of line item starts, award the housing program within two months following the fiscal year apportionment, maintain work-in-place sufficient to achieve beneficial occupancy dates and achieve maximum obligation of construction funds. To achieve the third major goal of fiscal year 1965, the Command required that the construction function, by minimizing administrative costs, obtain maximum design effort

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[2]At this time what Military Construction Programming responsibilities the Command had were carried out by Program IV. Until 1967, the Office of the Chief of Naval Operations was still primarily responsible for programming. See Chapter 9.

from available planning funds, obligate Operation Deepfreeze funds, reduce the number of change orders due to construction deficiencies, and revise and improve construction inspection. These goals were meant only as general management guidelines; it was up to the subordinate field divisions to plan the specific means of implementation.[3]

During fiscal year 1967, the Command maintained the same goals as in fiscal year 1966, with only one exception. The goal requiring improvement of construction was dropped.[4]

The Command's Program IV goals remained essentially unchanged for fiscal years 1968,1969 and 1970.[5]

In fiscal year 1971, the Command's goals again remained unchanged, however there was added emphasis on minimizing the impact of construction cost escalation. The Command also wanted a construction engineering manual developed that would provide maximum utilization of Contract Quality Control. The Command's concern here was the minimization of engineering and design defects. The Command was also concerned that Program IV broaden its cost engineering role to

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[3] BUDOCKS Operating Plan 1-66, pp. 12-14.

[4] NAVFAC Operating Plan 1-67, pp. 14-16.

[5] NAVFAC Operating Plan 1-68, pp. 14-15; NAVFAC Operating Plan 1-69, Program IV, pp. 1-3; NAVFAC Operating Plan 1-70, Program IV, pp. 1-3. Although general goals showed little change, the format of the Operating Plan underwent a radical change in both FY 1968 and FY 1969. These changes brought about some alterations in goal targets and secondary goals.

provide cost control from the budgeting (preliminary cost estimate) stage through the design, award and completion stages.[6]

Beginning in fiscal year 1972, the Command began issuing an entirely new management instrument, the Command Management Plan. As expressed in the Command Management Plan, it was Naval Facilities Engineering Command policy that, where possible, construction was to be carried out by means of private contractors. Such contract service, as well as supplies, construction, alteration, and repair of public works and utilities, was to be procured by formally advertised fixed-price contracts. If it could be shown that formally advertised contract procedures were unacceptable in any specific instance, negotiated contracts could be used when permitted by law and approved in advance at the Command level. Alteration and repair that was not incident to the maintenance of real property, as well as new construction, was to be performed by contract. Work was to be performed by civil service employees only when one or more of the following conditions existed: the work was of a minor nature, conditions made it impractical to prepare plans and specifications for contracting, the necessity for obtaining security clearances for contractor personnel would cause unacceptable delays, and the work must be performed intermittently to avoid disruption of other important operations.[7]

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[6] NAVFAC Operating Plan 1-71, Program IV, pp. 2-4

[7] FY 1972 Command Management Plan, NAVFAC P-441 (Jun 1971), pp. A28-A29.

All construction projects were to commence with a statement of requirement for which an engineering solution had to be provided. For military construction projects, a preliminary engineering report, which would determine the best engineering solution to the requirement, and would provide an accurate cost estimate as well as schematics and guideline specifications, was to be prepared. Final plans and specifications were to be based upon the approved program cost estimate. After the work was underway, it was to be prosecuted expeditiously and placed as soon as possible in the inventory of the activity. In all cases, construction was to comply with the intent of Congress as reflected in the approved program documents submitted with the budget request.[8]

Program cost estimates were to be prepared only for those projects which were in a foreseeable program. Any work which had been started on a project was to be terminated as soon as possible if it was to the advantage of the government and if the advice was received that the project was no longer in the program. Architectural-engineering and engineering services contracts, being for professional services, were to be negotiated in all cases after impartial consideration of an appropriate number of qualified firms. Work was to be spread among qualified firms to the maximum extent feasible.

Action was to be taken to ensure that architectural and engineering firms were held responsible to abide by the terms of the

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[8]FY 1972 Command Management Plan, NAVFAC P-441 (Jun 1971), pp. A28-A29.

contract awarded in regards to scope of work, scope of contruction project, estimated funding availability and design completion schedule as contained in the contract. Change orders to contracts were to be kept to a minimum, and were to be utilized only when it was not practicable to accomplish the work by means of a new contract. Wherever possible, they were to be executed before the contractor was permitted to proceed.[9]

The construction of all civil works at privately operated plants under the control of the Department of the Navy was to be the responsibility of the Naval Facilities Engineering Command. Inspection of construction was to be performed to ensure that completed work, and all the elements thereof, met the quantity, quality, dimensions, and operating characteristics prescribed in the specification.

Maximum effort was to be given to planning, designing, and constructing compatible and integrated shore electronics facilities that would meet the operational and functional requirements of the sponsor or user. This required active coordination and liaison with the sponsor, the field activity, the Naval Facilities Engineering Command and field engineering offices in all phases of the engineering and construction of the project.[10]

This policy was translated into six major program objectives. Under each objective there were from one to four intermediate goals.

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[9] FY 1972 Command Management Plan, p. A29.

[10] Ibid.

The first major objective called for the minimization of the impact of construction cost escalation and increased responsiveness to the functional operational requirement. To achieve this, the Command called for the completion of plans and specifications for 75 percent or more of each annual military construction program by 31 October and completion of plans and specifications for 100 percent of each annual military construction program by 30 April.[11] The second objective was to bring facility design and construction specifications more into line with current accepted industrial practices. To achieve this, the Command ordered the use of turn key procurement procedures, system building concepts and other changes in the state of the art to contracting and procurement methods for construction. The third program objective called for the provision of cost-effective engineering and design for optimum satisfaction of functional and operational requirements. To achieve this, the Command ordered the adaptation of designs for a minimum of 10 percent of military construction line items and the utilization of definitives and/or standard designs for a minimum of 50 percent of military construction line items. The fourth program objective was the elimination of engineering and design defects. To do this, the Command called for the implementation and maintenance of a system for documenting and evaluating the quality of engineering and design. The fifth program objective was the achievement of high quality construction

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[11] FY 1972 Command Management Plan, p. A29.

at minimum cost and the provision of usable facilities within the required time. To achieve this, the Command called for full implementation of the Command's Quality Assurance Program, development of an inspection cadre composed of engineers for competent construction surveillance, development of Resident Officers in Charge of Construction staffing guides based upon facility type and the completion of 100 percent of projects within the customer's agreed beneficial occupancy date.

The sixth program objective called for the advancement of the Command's capability to perform construction of ocean facilities reliably and at minimum cost through contract. To achieve this the Command called for the identification of shortcomings in contract construction of ocean facilities and the statement of these as requirements for modification of planning, design, contract, and operating procedures.[12]

While fiscal year 1973 saw no changes in program policy, there were changes in the Command's objectives. Now a major Command objective was to manage effectively and efficiently the execution of all acquisition projects from the feasibility study stage through design, to construction and transfer to the customer. To achieve this, the Command called for the execution of design and construction phases of the military construction program to achieve schedule starts in order to facilitate the earliest beneficial occupancy.

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[12] FY 1972 Command Management Plan, p. A29.

All other goals generally remained unchanged. During fiscal year 1973, the Naval Facilities Engineering Command placed major emphasis on upgrading the operation of the Construction Management System, advancing the capability to perform construction of ocean facilities, managing and expediting the acquisition of Undersea Long Range Missile System facilities, and continuing implementation of the Quality Assurance Program.[13]

The year 1974 saw only one significant change in construction program objectives from the previous year. To achieve its goals of effectively and efficiently managing the execution of all acquisition projects, the Command called for the coordination of total collateral equipment in support of all military construction and military construction reserve line items.[14]

During fiscal year 1974, the major emphasis of the Construction Program was on improving the quality of construction and satisfying customer needs in the face of diminishing resources. The Command sought to achieve these goals in a number of ways: by emphasizing construction execution planning during preliminary cost estimate and design phases in order to optimize construction packaging and the manner of accomplishment, by providing for constructability reviews during design phases from concept through completion, by emphasizing cost control from the initial design phase, by focusing

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[13] _FY 1973 Command Management Plan_, NAVFAC P-441 (Jun 1972), pp. B-20 & 21.

[14] _FY 1974 Command Management Plan_, NAVFAC P-441 (Jun 1973), Program IV.

attention on the implementation and evaluation of the deficiency analysis data system to identify major problem areas for improvement, and finally by continuing to upgrade the knowledge and skills of construction representatives through participation in Naval Facilities Engineering Command and Army Corps of Engineers inspector training schools and selected Civil Engineer Corps Officers School courses.

The Command set the following additional goals for itself in fiscal year 1974: upgrade the Construction Management System to achieve a maximum error-rate of 1 percent, advance the capability to construct ocean facilities, evaluate the quality of medical facilities being provided in order to effect improvements in criteria, design, and construction and apply these improvements to the medical facility modernization effort, evaluate the quality of family housing being provided in order to effect improvements in criteria, design, and construction, commence construction of shore facilities for the Trident Program, and improve liaison at the field division level with architectural and engineering construction contractor groups and other agencies involved in construction.[15]

Further the Command was concerned with the implementation of the functions and tasks assigned to the areas of project planning and project engineering associated with the Communications Electronics Program. Finally, the Command bent its efforts toward

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[15] FY 1974 Command Management Plan, Program IV.

the execution of the design and construction phases of the Navy and Marine Corps Operations and Maintenance Funded Facilities Projects Program.[16]

The Command's fiscal year 1975 goals remained essentially the same as those set the previous year. Further effort in all these goal areas was to be continued.[17]

An examination of the Command's goals during the period under consideration demonstrates that a major Command concern was the improvement of its management techniques. If the Command was to successfully coordinate projects so that they could be completed within the times and costs allotted, it simply had to have information available at all times on the status of its projects. To achieve this end, the Command developed complex, highly sophisticated management systems and reporting techniques. Among the most important systems developed during the last decade were the Command Management System which provided fiscal and status information to the Command for all ongoing projects and the Command Management Technique for control of individual projects.

## THE CONSTRUCTION MANAGEMENT SYSTEM

The Command's Program Coordination Office was tasked with maintaining a reporting system on all engineering construction. The

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[16] FY 1974 Command Management Plan, Program IV.

[17] FY 1975 Command Management Plan, NAVFAC P-441 (Jun 1974), Program IV.

system in use in 1974 was the Construction Management System. This completely automated reporting system was introduced in 1971 to replace the manual system and the automatic 2318/2319 system then in use. Because the two systems did not combine status information with fiscal information, the biggest problem became the amount of turn-around time necessary at Command Headquarters. Unlike the old system the new Construction Management System combined status and fiscal information together in one single report. The Construction Management System was a subsystem of the Engineering Field Division Management Information System. The Construction Management System along with Military Construction shared the same data base for both status and fiscal information, the Master Data Management file.

The Engineering Field Division Management Information System (EFD/MIS) was composed of six subsystems: Military Construction (MILCON), Construction Management System (CMS), Design Management System (DMIS), Integrated Program Management System (IPMS), Resources Management System (RMS), and Cost Engineering (CE). In 1975, long-range plans called for the complete integration of all six subsystems into one system sharing a single integrated data base. This common data base was to provide information on financial as well as managerial data for all levels of management (Resident Officer in Charge of Construction, Engineering Field

Division, Command Headquarters, and the sponsor), through all phases of construction.[18]

The construction management reports produced by the system were divided into specific phases that identified various stages of construction: concept studies, preliminary cost estimates, final plans and specifications, construction, and equipment procurement. This meant that reports could be generated which covered a single, or, as in the case of the project status report, several phases of a given project. The Command published the construction management reports on a monthly basis. The capability existed for more frequent reporting, however the monthly reports, published around the tenth of each month, proved satisfactory for most management requirements.[19]

## CONSTRUCTION MANAGEMENT TECHNIQUE

The construction management tool, known as the "Construction Management Technique," was an automatic data processing reporting system used to monitor for the Command and the contractors all phases of the myriads of projects underway at any given moment. The system was developed during period 1970-72 using a similar system employed by the Veterans Administration. One of the central

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[18]"Appendix V-C-1, Construction Management System (CMS)," Point Paper, NAVFAC Construction Program Coordination Office, Code 05C.

[19]Ibid., pp. 6-7

features of the Construction Management Technique system was its use of critical path method planning.

The critical path method (CPM) for planning, scheduling, and monitoring was developed in the early 1960s. However, it fell somewhat into disrepute during the mid-1960s. This was the result of unfavorable experiences incurred by users. Without analysis of the failure, i.e. (1) unfamiliarity with the concepts, (2) failure to use appropriate updating procedures, and (3) quality limitations and expense of computerized software for analysis, the method was declared by some impractical and unusable.[20]

Despite a negative assessment, many contractors, recognizing the value of critical path method schedulings, continued to use it on construction. Approximately 96 percent of the A.G.C. contractors in the Washington metropolitan area used critical path method scheduling on complicated projects. As a result of the use of critical path method scheduling by such forward-looking contractors, improved procedures and software were developed to facilitate critical path method use. Recognizing this in 1970, the Commander of the Naval Facilities Engineering Command directed that increased emphasis be placed on the use of the critical path method in the Command's construction contracts to expedite the completion of facilities. Through interagency training with the Army Corps of Engineers, training of the Command's construction personnel began in 1970.

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[20] Evaluation Report: Construction Management Technique (CMT) (1 Aug 1973), tab 2, NAVFAC Construction, Code 053.

Two hundred personnel had been trained by 1973. In February 1971, NAVFAC Instruction 5200.10B was issued requiring use of the critical path method on any Command contract if it was deemed beneficial to the government.[21]

NAVFAC Notice 5230 of 9 February 1970 indicated that the Construction Management System and the Engineering Field Division Management Information System should be based on critical path method generated information. In order to accomplish this type of integration it was necessary that the standard critical path program be used with one format to provide a common data base. Review of several critical path method oriented management programs, offered by private consultants, was made. The Compass Company of Alexandria, Virginia had done a great deal of work developing a critical path method management system for the Veterans Administration, at considerable cost to that agency. The system had definite advantages in ease of updating, flexibility, and exception reporting. The system also allowed cost, trade and area network diagram loading, and analysis of the same for processing payments and monitoring. With some minor modifications this program was easily adapted to the Command's needs.

A pilot project was implemented in the Southern Division of the Naval Facilities Engineering Command in 1972 to study and analyze the use of the critical path method for the planning,

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[21]Evaluation Report: CMT, tab 2.

scheduling, and monitoring of construction on Command contracts, and to determine if accurate reliable construction information could be furnished to the Construction Management System/Engineering Field Division Management Information System utilities critical path output.[22] The sum of $20,000 was allocated to implement the program, $15,000 for automatic data processing and $5,000 for communications and contingencies.

The pilot project included five projects; eight bachelor enlisted quarters; three bachelor officer quarters; one dental clinic; and one, six story, engineering management building. All contracts totaled approximately $14 million. The Construction Management Technique utilized the latest techniques in critical path method operations. It included scheduling and monitoring by trade, cost, and area of work, as well as automated payment processing, cost projection and collection, and exception reporting at all levels. It enabled the Navy to analyze project schedules including design, prior to award, and at anytime to study the impact of changes during the construction process.

An evaluation of the pilot project was made and it indicated that the Construction Management Technique was successful, in that two of the five projects were completed ahead of the contract completion dates, despite the issuing of numerous order changes.

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[22] Evaluation Report: CMT, tab 2.

The remaining three were scheduled for completion on the contract completion dates. In addition, certain parts of the Construction Management Technique could be adapted to provide construction data to the Construction Management System/Engineering Field Division Management Information System in the form of automated payment processing, and work-in-progress projections after the award.

As with any new program, implementation of the project was not accomplished without problems. Management improvement made necessary more administrative work, but this was unfortunately unavoidable. Except in one instance, since corrected, no major faults were found with the program.

A further test of Command Management Technique was carried out by the Command's Northern Division. The Navy was constructing a 1,200 PSI hot plant at the Naval Training Center, Great Lakes, Illinois (this project is discussed in greater detail elsewhere in this chapter). The Chief of Naval Operations directed that this project be completed by 31 December 1975. In February 1973, the Naval Ship Systems Command project manager (this Command was responsible for finishing the actual propulsion unit for the training facility) required that critical path method scheduling dates be furnished on a weekly basis rather than only once a month, as was required by the contract. The contractor's automatic data processing consultant did not have the capability to furnish weekly updates, and was reluctant to obtain outside assistance to do so. At the request of the Northern Division, the Command arranged for the Construction Management Technique consultant to provide the service,

plus additional consultation. Combined computer processing charges for the Construction Management Technique pilot and the Great Lakes project totaled $21,000. The consultant advised that this could be reduced to $10,000 if the Construction Management Technique proprietory programs were procured under license for five years, after which they would become Navy property. This meant that the Navy could procure a system priced normally at $17,000 at an additional cost to the government of $6,000. As the system could be used in many ways by the Command, it was decided to go ahead and procure it, thus giving the Navy a viable tool for planning, scheduling and analysis.[23]

The Naval Facilities Engineering Command procured the software to place the Construction Management Technique in use anywhere the Navy might decide it would be beneficial. Consequently it was recommended that all Engineering Field Divisions, Mobile Construction Battalions and project managers of complex or high dollar value projects should be made aware of the availability of the Construction Management Technique Program and to utilize it as they might desire.[24] In addition it was recommended that those persons concerned with the Construction Management System/Engineering Field Division Management Information System should be made aware of the available

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[23] Evaluation Report: CMT, tab 2.

[24] Ibid., tab 1.

programs to determine the possible utilization of the Command Management Technique as feeder information for the overall management information system.

What exactly was the Command Management Technique? It was a multi-level, multi-project, information system based upon analysis of contractors critical path method networks for projects. The multi-level feature allowed for exception reporting, i.e., giving various types and levels of information to the contractor, Resident Officer in Charge of Construction, Engineering Field Division, or other users on single or multiple contracts, as required. The multi-project feature allowed the use of a standard data base to produce an overall management information system which also had great value whenever the Command desired to utilize phased (fast track) design and construction, or multi-year funding.[25]

What led to the development of the Construction Management Technique? A review of the Construction Management System developed by the Command indicated a gap, in that the Resident Officer in Charge of Construction was given no tool to keep jobs on track, eliminate manual reports, nor to facilitate making accurate input to the system as to the percentage of project completion both in terms of money and time. Such a management instrument was deemed essential to an effective construction management system.

Under the Command Management Technique, the contractor was required to plan his job by utilizing a critical path method

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[25]Evaluation Report: CMT, tab 3.

diagram. Each activity could be supplied, as required, with the description, duration, cost, and trade which would accomplish the work, and the area of the work. Once the diagram was submitted to, and approved by the Navy, the contractor only participated in updating, unless his plan was subjected to a major revision. The plan was always the contractor's and he was responsible for completing the work therewith.

The Navy's responsibility under the Command Management Technique was as follows: upon receipt of the contractor's approved network, the Command, through an automatic data processing consultant or "in-house," analyzed the diagram and furnished the Resident Officer in Charge of Construction/Engineering Field Division/contractor standard critical path method schedules, as well as additional reports of value to the contractor, Engineering Field Division and Resident Officer in Charge of Construction. These included automated progress payments, monies earned for monitoring the progress of the contractor's own and sub-contract work.[26]

The Construction Management Technique and the contractor prepared network analysis did not differ in their basic approach; they differed only in their processing. All normal critical path method schedules were available under the Construction Management Technique, plus additional print-outs. Updating was facilitated through use of projections of the contractor's own plan. Also, as Construction Management Technique was capable of multi-project and multi-level

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[26] Evaluation Report, CMT, tab 3.

reporting analysis, it was of benefit for input to the Construction Management System.

As with any system, there were both advantages and disadvantages inherent in using the Command Management Technique. Previously contractors objected to getting involved with automatic data processing companies. Government processing of the network under the Construction Management Technique relieved the contractor of this burden. Another advantage was that standard formats could be developed, which did not vary much from job to job. With the Construction Management Technique the cost to the Command was less (66 percent) for more information displays than normal automatic data charges to a contractor for standard schedules. Also, the Command had control over the system. Should the Command desire to make a change order, it could, through the use of the system, determine its effect prior to issuance. The status and updated schedules could be obtained as often as desired, through Command updating, without the need to approach the contractor. The information obtained was easier to read than standard critical path method printouts. Updating of projects was done on an actual projection of the contractor's plan and required minimal effort from the Resident Officer in Charge of Construction and the contractor. The contractor was not required to fill out load sheets. Exception reports were easily produced to specified parameters. Activities could be sorted and displayed by the "responsible party," including the government, for monitoring and updating.

Finally, defects inherent in a new system had already been eliminated as the Command's Construction Management Technique system was adapted from a system that had already been used by the Veterans Administration for two years.[27]

Against these advantages were several disadvantages. Under the Construction Management Technique, the success of an operation depended upon an adequate, logical, network diagram. This required the contractor to plan the job in greater detail, and led to some contractor resistance. The processing of the network by the government meant that it accepted some of the responsibility that would normally have been the contractor's. However, this responsibility could be transferred to a Navy consultant or back to the contractor. Another problem lay in the realm of information updating. When there was a failure to give adequate attention to this updating, the "garbage-in-garbage-out" principle applied.

Finally, how did the Construction Management Technique actually operate? The contractor prepared a "loaded" network diagram. All activities required by the government were included. Weekly, biweekly, monthly, at each update period, the Resident Officer in Charge of Construction and the contractor representatives surveyed the job and, based on the contractor's plan, updated, on a projection of the contractor's plan, the actual status of each item. This consisted of inserting a percent complete for an activity,

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[27] Evaluation Report: CMT, tab 3.

and the payment agreed to for material on site. Activities for which the government was responsible were updated in the same manner by the Resident Officer in Charge of Construction. Revised schedules and payment documents were transmitted back to the Resident Officer in Charge of Construction/Engineering Field Division/contractor for completion of processing and monitoring for the next period.[28]

The Command Management System and Command Management Technique were not only essential for facilitating project completion, but also furnished information necessary for the profit and loss system of accounting that the Command utilized. Work-in-Place was the key to this accounting system.

## WORK-IN-PLACE

Work-in-Place (WIP) was a management device developed by the Command for measuring the portions of a facility or project completed during a given fiscal year. It was used to monitor military construction, reserve military construction, Air Force military construction and family housing.[29]

On construction projects, the Command allowed 6 percent of funds allocated for administrative and salary costs and 94 percent

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[28] Evaluation Report: CMT, tab 3.

[29] Interview with Mr. A. F. Malloy, NAVFAC Construction, Code 0562, 28 May 1975.

of funds for actual construction.[30] Work-in-Place monitored the total amount of construction done each year to earn the necessary 6 percent. Each dollar of construction actually completed earned six cents for the Command to use in meeting its overhead costs (SIOH--supervision, inspection and overhead). Thus, for accounting purposes, the Command operated on a pay-as-you-go basis. With its 6 percent the Command had to support its Headquarters, the Officers in Charge of Construction, the Professional Development Center and the Engineering Field Divisions.

The Command's Program Coordination Office, responsible for monitoring Work-in-Place, concerned itself with making sure that sufficient work was done each fiscal year to produce the necessary 6 percent so that the Command could break even on its overhead expenses.

In 1975 there still existed a financial cushion left over from the Vietnamese War. During the war, the Command's earnings were much greater than its overhead costs, due to the magnitude of the projects undertaken. In 1975, the money earned by the Command during this period still formed a fund of approximately $10 million. This money could legally be used to offset areas where the Command

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[30]Actually, the yearly total earned was somewhat less than 6 percent, since certain types of projects had restrictions placed on the amount that could be used for overhead (family housing 3.5 percent and only 1 percent for civil projects). The total earned each year really averaged about 5.6 percent.

went into the red (the result of construction freezes, performance problems, design delay and so forth.)[31]

The Command's Program Coordination Office produced an annual Work-in-Place estimate. This was a projection of the construction to be done in each fiscal year. This Work-in-Place estimate was used by the Command as the basis for staffing and assigning personnel to the field.[32]

CHART 10-1 WORK IN PLACE (ACTUAL) FY 1965-1974

| Fiscal Year | $ (millions) |
|---|---|
| 1965 | 371.4 |
| 1966 | 571.4 |
| 1967 | 1,106.1 |
| 1968 | 752.1 |
| 1969 | 823.1 |
| 1970 | 587.1 |
| 1971 | 581.3 |
| 1972 | 628.8 |
| 1973 | 568.4 |
| 1974 | 618.0 |

The 6 percent of that which the Command was allowed for overhead was not a negligible sum. The Military Construction Program alone was authorized a total of $4,591,377,448 during the years under consideration in this history.

[31] Malloy interview.

[32] Ibid.

CHART 10-2 MCON AUTHORIZATIONS

| Fiscal Year | | Public Law | Initial Authorization | Amendments | Total |
|---|---|---|---|---|---|
| 1965 | | 88-390 | 225,639,000 | 480,000 | 226,119,000 |
| 1965 | | 88-637 | 2,500,000 | | 2,500,000 |
| 1965 | RVN | 89-18 | 22,000,000 | | 22,000,000 |
| 1966 | RVN | 89-188 | 311,412,000 | 13,487,000 | 324,899,000 |
| 1966 | RVN | 89-213 | 43,210,000 | | 43,210,000 |
| 1966 | RVN | 89-188 | 13,100,000 | | 13,100,000 |
| 1966 | RVN | 89-367 | 261,000,000 | | 261,000,000 |
| 1966 | RVN | MAP | 11,407,599 | | 11,407,599 |
| 1967 | | 89-568 | 137,874,000 | 10,803,000 | 148,677,000 |
| 1967 | RVN | 90-5 | 136,000,000 | | 136,000,000 |
| 1967 | | MAP | 13,787,854 | | 13,787,854 |
| 1968 | | 90-110 | 461,132,000 | 10,649,000 | 471,781,000 |
| 1968 | RVN | 90-110 | 17,964,000 | | 17,964,000 |
| 1968 | RVN | 90-110 | 5,226,000 | | 5,226,000 |
| 1968 | | 90-392 | 11,300,000 | | 11,300,000 |
| 1969 | | 90-408 | 236,591,000 | 14,333,000 | 250,924,000 |
| 1969 | | 90-408 | 51,357,000 | | 51,357,000 |
| 1970 | | 91-142 | 306,305,000 | 8,372,000 | 314,677,000 |
| 1971 | | 91-511 | 268,898,000 | 6,109,000 | 275,007,000 |
| 1972 | | 92-145 | 321,843,000 | 3,993,000 | 325,836,000 |
| 1973 | | 92-545 | 515,667,000 | 17,743,000 | 533,410,000 |
| 1974 | | 93-166 | 570,439,000 | 10,400,000 | 580,839,000 |
| 1975 | | 93-552 | 550,956,000 | | 550,956,000 |

The area where the Naval Facilities Engineering Command achieved its most impressive accomplishments during the years 1965-1974 was without doubt Southeast Asia. Specifically, the Command's greatest efforts between the years 1965 and 1972 were in Southeast Asia, more particularly, in South Vietnam.

VIETNAM

The Vietnamese War was one of the most important events that took place during the period 1965-1974. The Naval Facilities Engineering Command played an extremely important role in meeting the tremendous construction needs generated by what could be fairly characterized as a "logistical conflict." Although United States involvement in the conflict began only in 1950, the roots of the Vietnamese War go back many years.

Rebellion and insurrection by the Vietnamese against their French colonial masters dated from the 19th Century. In the 20th Century, many different Vietnamese nationalist organizations as well as the Vietnamese royal family were active in the struggle against the French.[33]

In the 1920s a new element was added—communism. Ho Chi Minh, a communist since 1920, founded a unified Indochina Communist Party in 1930. He persuaded some of the nationalist exile groups to join the communists in a united front organization called the Vietnam Independence League (later called the Viet Minh) which worked against the French.[34]

During the Second World War, Ho Chi Minh's insurgents opposed the occupying Japanese and received limited arms support from the Allies.

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[33] U.S. Army Handbook for Vietnam, DA Pam 550-40, p. 20.

[34] Ibid.

After the war France attempted to regain control of Vietnam, shattering both nationalist and communist hopes for independence. As a result, fighting broke out between the French forces and those of the Viet Minh in 1946. This war, known as the "Indochina War," was to last until 1954, when after a disastrous defeat at Dien Bien Phu, the French withdrew and the country was partitioned at the 17th parallel. In essence Ho Chi Minh"s Communists ruled north of this line and the State of Vietnam, originally established as a protectorate of the French, ruled south of it. The Geneva accord which was to settle the conflict stipulated that elections were to be held in 1956 to reunify the country under a single government. The elections were never held and communist guerrillas, supported by North Vietnam, began a war of insurgency in the south.[35]

Although it had previously been supplying arms to the French for use in the war, the United States first became directly involved in Vietnam only in 1950. In February of that year the United States and Great Britain formally recognized the French protectorate State of Vietnam (headed by the Emperor Bao Dai) as the government of Vietnam. In May, the United States announced a decision to give aid to Vietnam through France, and a United States economic mission was sent to Saigon.[36]

In September 1951, the United States signed an agreement to provide direct economic assistance to South Vietnam. Under the

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[35] U.S. Army Handbook for Vietnam, p. 28.

[36] Ibid.

agreement non-military construction work was undertaken by the United States Operations Mission and later by the United States Agency for International Development. Military aid was provided by a Military Assistance Advisory Group.

In September 1954, Premier Ngo Dinh Diem requested additional United States military and economic aid from President Eisenhower, because of the communist insurgency his government had to face. The request was granted on 24 October 1954 and the amount of aid earmarked for the Republic of Vietnam increased rapidly during the next few years. In 1955 Premier Diem held a plebiscite in South Vietnam. The results ousted Emperor Bao Dai as head of state. South Vietnam was proclaimed a republic and Diem became its first president on 26 October 1955.

Construction constituted an important part of the aid that the new republic was to receive and the Navy and its agent, the Naval Facilities Engineering Command (then the Bureau of Yards and Docks), played a crucial role in Southeast Asian construction. In a memorandum of 27 February 1956, the Assistant Secretary of Defense for International Security Affairs assigned responsibility for implementation of worldwide construction responsibilities. The memorandum reads: "Responsibility for implementation of construction included within these programs (the Direct Forces Support Program for Fiscal Year 1956) is assigned to the Department of the Army and Navy as follows: Department of the Army: Turkey, Iran, Pakistan, Taiwan, Korea, and the Department of the Navy: Thailand, Cambodia, Laos, Vietnam and the Philippines."

In 1962, the Naval Facilities Engineering Command was designated contract construction agent for Southeast Asia.[37]

Although the Command itself did not become heavily involved in Vietnam until the 1960s, Civil Engineer Corps Officers and Seabee enlisted personnel had already been active in Vietnam since the early 1950s. In 1954, Seabees from Amphibious Construction Battalion 1 built refugee camps for those individuals who fled south to escape communist rule and in 1956, a team composed of one Civil Engineer Corps officer, five Seabees, and Army and civilian personnel carried out a road survey in the back areas of Vietnam at Diem's request.[38]

In 1960, the Deputy Chief for Logistics of the Military Assistance Advisory Group in Vietnam discussed the implementation of an airfield building program in Vietnam with the Command's Officer in Charge of Construction, Thailand. Following the conference, this officer, who was in charge of all military construction for Southeast Asia, prepared a preliminary document entitled "Airfield Construction Implementation Conference, Saigon, 6 December 1960.[39] This document presented the first definition of the mechanism for carrying out a civilian contractor building operation in Vietnam under the Command's OICC in Bangkok. A Resident Officer in

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[37] A History of the Officer in Charge of Construction, Vietnam, NAVFAC Hqs (1967-68), p. 3; Memo from Deputy Asst. Secretary of Defense (P&I) of 8 Mar 1963.

[38] Richard Tregaskis, Southeast Asia: Building the Bases, (U.S. Government Printing Office, 1975), p. 17.

[39] Ibid., p. 22.

Charge of Construction was appointed for Saigon and his office was opened in February 1961. Shortly thereafter followed the letting of the first large-scale design contract (NBy 32717 for airfield design) to be administered by the Navy in Vietnam. The major contract with the primary contractor consortium was to follow the next year.

In 1962, the status of the Saigon construction officer was raised from a Resident Officer in Charge of Construction when he became Deputy Officer in Charge of Construction for Southeast Asia. Three years later the magnitude of increasing construction justified another upgrading of this officer's role. On 1 July 1965, the officer became Officer in Charge of Construction, Vietnam. The Saigon office was no longer a mere dependency of the Bangkok office.[40]

Until 1 July 1964, the construction program in Vietnam consisted principally of the Military Assistance Program which provided facilities for the Republic of Vietnam's armed forces. The initial input of funds for the Military Assistance Program in 1962 was $16 million. Additional Military Assistance Program funds were assigned for new work in 1963 and in the fall of 1964. During that period, the average construction rate was about $1 million per month.

In July 1964, the building effort that had been initiated four years earlier was in the process of phasing down. Major planned construction was nearly complete and the number of Americans and

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[40]Tregaskis, p. 107.

and third country nationals[41] working for the private contractors had dropped to only 130. The Tonkin Gulf incident and the subsequent increase of direct United States involvement in the Vietnamese War dramatically changed all this.[42]

The first sign of increased construction activity came in September. Notices-to-Proceed (NTP) for projects totaling $19 million were given to the contractors. In late 1964 and throughout 1965, the changes in United States military force levels required major increases in the construction program. In November 1965, a goal was established to achieve a placement rate of $40 million per month by October 1966. This goal was achieved in September 1966. The work rate reached a peak in March 1967 when $63 million worth of work was placed.

The year 1965 saw a dramatic increase in United States participation in the South Vietnamese fighting. This of course also meant that there was an increase in the Naval Facilities Engineering Command's role in that area.

The Command as the Department of Defense agent in charge of contract construction in Vietnam, was responsible for building the required facilities assigned to the Officer in Charge of Construction for execution in the most expeditious manner possible.[43]

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[41] A term used to describe personnel who were neither American nor Vietnamese. Most who fell under this category were Japanese, Filipino, or Korean by nationality.

[42] Tregaskis, p. 77.

[43] Information from NAVFAC Construction, Code 05.

After the establishment of the office of Officer in Charge of Construction, Republic of Vietnam, the recruitment of qualified civilian personnel proved to be a difficult, frustrating and tedious process. Even those applicants who responded to recruitment efforts were frequently found to be unqualified, inexperienced and unable or unwilling to adjust to the Vietnamese environment. To help fill the void created by the lack of qualified personnel, teams of temporary duty personnel were brought in from Naval Facilities Engineering Command Headquarters and from the Engineering Field Divisions. These teams provided accounting, project management, reporting, personnel, contract and technical assistance. Third country nationals, as well as native Vietnamese were also employed. Not only was staffing in general a problem, but so was continuity of staffing, a problem resulting from the one year duty tours common at this time.[44]

One of the major problems facing both the Officer in Charge of Construction and the civilian contractors was a lack of communication facilities. This lack of adequate facilities, telephonic, radio, and other forms of communication, hampered the accomplishment of construction during the Command's first years in Vietnam.[45]

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[44] Linden L. Gahart, Construction Problems and Achievements, NAVFAC Hqs. (1968), p. 14.

[45] Ibid., p. 18.

Southeast Asia presented the Naval Facilities Engineering Command with several additional construction problems. One major problem was that all planning, design and construction had to be telescoped into a shorter time period than would normally have been the case.

Another major problem involved the climate. The monsoons and other climatic extremes made it almost impossible to carry out construction work during certain times of the year. There were also problems concomitant with the fact that much of the necessary construction had to be carried out in a war zone. Given this fact, protection of life and property was always a factor in construction planning.

Other hinderances to the Command's construction program in Vietnam were the long lead times necessary for procurement of all imported materials and the difficulties involved in the acquisition of real estate in Vietnam. Minor, through no less aggravating problems resulted from peculiar social conditions in Vietnam, which required special construction techniques. A final and rather unique problem was the moving of graves from job sites. While every effort was made to avoid building on cemetary sites, sometimes the exigencies of war, made such avoidance impossible. Where construction was programmed on Vietnamese burial sites, although every care was taken, it was extremely difficult to avoid offending the religious sensibilities of the Vietnamese. The vast majority of the Vietnamese are Buddhists, and ancestor

worship is a central part of their religion. Thus, the graves of their ancestors were sacred to them and any attempt to disturb these graves was viewed with hostility.

Contracts

The Command decided in 1961 that Vietnam construction was to be accomplished primarily by means of the fixed price contract. The fixed price contract was the standard Navy construction contract. Since profit depended entirely on the contractor's own operations, it promoted efficiency and, at the same time, it was relatively simple to administer.[46] The Officer in Charge of Construction was responsible for seeing that the contractor built what was required in accordance with the plans and specifications provided and within the allowed time frame.

For the fixed price contract to be effective, it was necessary that the contractor be furnished a complete design based upon site surveys and engineering studies and that the contractor be able to operate without unreasonable constraint. Unfortunately conditions deteriorated rapidly in Vietnam after 1961. The worsening military situation generated greater urgency for the completion of projects. It became obvious that time could be saved if the contractor was allowed to begin work before final design completion. The wartime

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[46]Tregaskis, pp. 30-31

situation also restricted the contractor's freedom of action in many areas and affected the availability of an adequate labor force.[47]

To ameliorate the situation, the Command decided that the total work of the major contractor could best be accomplished under a cost plus fixed fee contract. Under such a contract, the contractor built a specific project and was reimbursed for the costs associated with the work. The government assumed risk for changes in conditions and allowed work to proceed even though design was not yet completed. Profit was not dependent upon the job being completed within a fixed price; profit was determined in a different fashion. At the time the contract was awarded, a fixed fee percentage was agreed upon. The size and complexity of the project determined the size of the percentage. The actual fee to be paid was determined by applying this percentage to a previously agreed estimate of the cost of the project. The Officer in Charge of Construction and the contractor negotiated the estimated cost to arrive at the actual fee before work commenced.[48]

Following the expansion of the war in 1965, it was realized that the major cost plus fixed fee construction contract was going to exceed $1 billion. Under these new conditions, the Command recognized that the 3 percent fee percentage, negotiated for the originally planned $15 million construction effort, would be

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[47] Tregaskis, pp. 30-31.

[48] Ibid.

higher than appropriate. The Command wanted to renegotiate the contract to provide for a lower percentage of profit. This was a difficult business since the contractor consortium of RMK-BRJ[49] was already fully mobilized in Vietnam and there was no reasonable way for the Command to get the construction done without it. Despite this the Command did manage to renegotiate the contract so that the contractor would get a lower percentage of profit. This was done by introducing a concept used successfully in weapons procurement contracts, the incorporation of an award fee into the contract. The award fee was an incentive for the contractor to operate at a high level of efficiency and effectiveness. This lack of incentive was a major drawback of the cost plus fixed fee contract.

The negotiations resulted in a new fixed fee percentage of 1.7 percent called the "base fee." The new maximum award fee was to be .76 percent and the maximum fee the contractor could be paid was 2.46 percent. Contractor effectiveness determined the amount paid by the award fee. On 1 May 1966 the contract was officially converted from cost plus fixed fee to cost plus award fee.

The new fee structure was incorporated into the basic contract by a supplemental agreement which specified the conditions for its payment. The contractor's performance was to be judged every six

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[49]Short for "Raymond International, Morrison-Knudsen, Brown and Root, Inc., and J. A. Jones Construction Co.." More will be said about this consortium of construction companies later in this chapter.

months against a series of award fee objectives. Periodically, the objectives and revisions were formally incorporated into the contract by means of the supplemental agreement. Thus, the contractor knew what the Officer in Charge of Construction thought to be of major importance at any given time. During each semi-annual rating period, the Officer in Charge of Construction's staff maintained a record of the contractor's performance against the objectives set. From this a report was compiled for review by the Award Fee Evaluation Board, chaired by the Deputy Commander, Pacific Division, Southeast Asia. The board's report was submitted to Command Headquarters. The contractor if dissatisfied could appeal the report.[50] The award fee rating curve shown in Chart 10-3 gives some idea of contractor performance under the new system.

Approximately two years after the award fee system was adopted, a significant flaw was discovered in it. The shape of the award fee curve, as Chart 10-4 shows, was very flat.

This resulted from the fact that the new system provided an award fee (albeit a low one) even at very low effectiveness ratings. The problem in 1968 was whether there was sufficient incentive left in the fee structure to assure that the joint venture contractor would continue to assign top-flight people for the as yet indefinite life of the contract.

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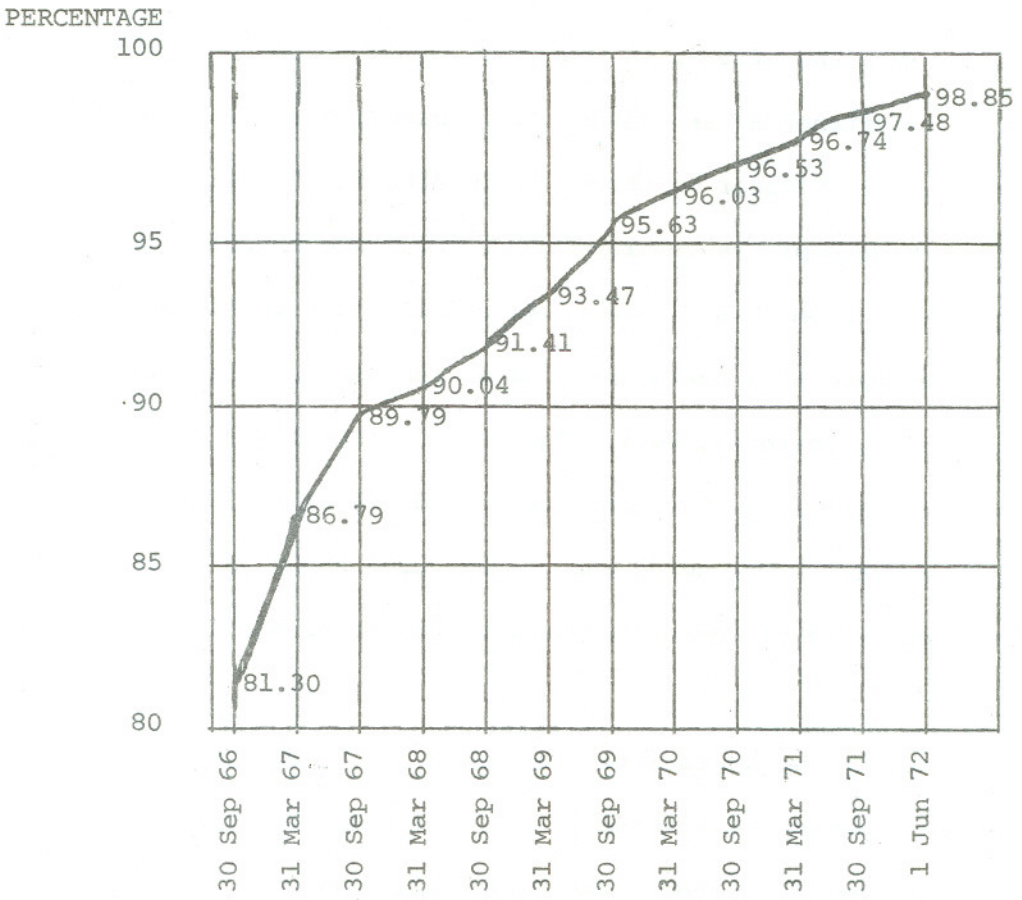
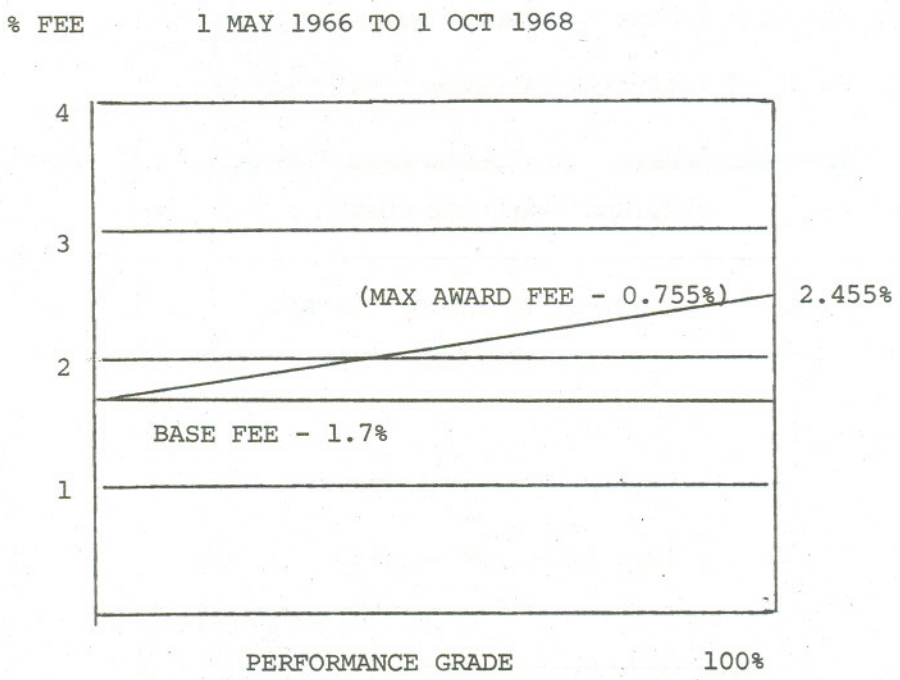
[50]Tregaskis, p. 217.

CHART 10-3 AWARD FEE RATINGS[51]




[51]Tregaskis, Figure 12, p. 217.

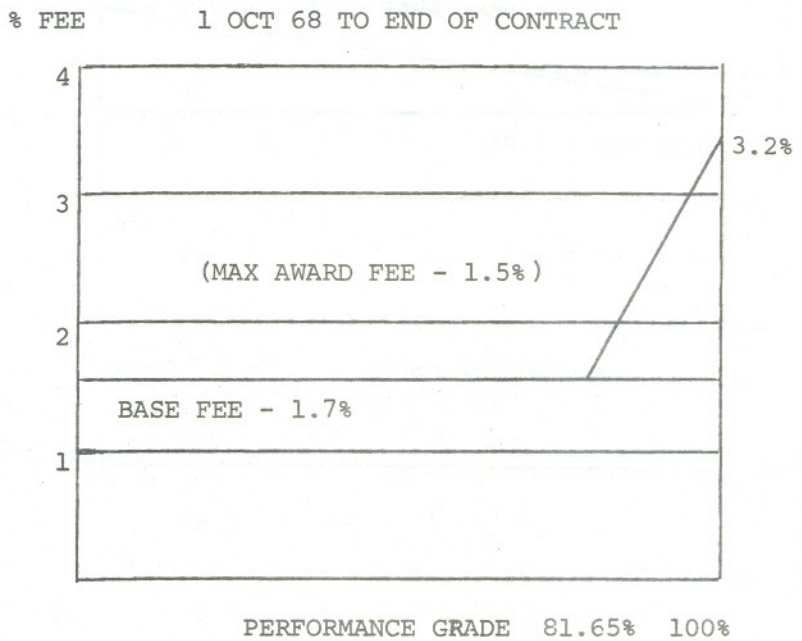
CHART 10-4 ORIGINAL AWARD FEE CURVE[52]




[52]Tregaskis, Figure 11, p. 216.

After some study of this problem, the award fee was revised to provide more incentive. The fee curve was made steeper and provided that the contractor would get no award fee if his rating fell below 81.65 percent. The incremental gain or loss as the rating changed was significant enough to provide the contractor with a real incentive. The contractor could now earn a maximum of 3.2 percent (see chart 10-5). Although the worth of the award fee system could not be precisely measured, it was felt that the additional fee paid to the contractor was saved several times over as a result of increased management effectiveness.[53]

CHART 10-5 REVISED AWARD FEE CURVE[54]




[53] Tregaskis, p. 219

[54] Ibid, Figure 13, p. 218.

After the Command closed out its contract with the major contractor in June 1972, what construction remained to be done was carried out by lump-sum contract. Approximately $25 million worth of additional construction was placed by this means.[55]

For most of the period of United States involvement in Vietnam, contracts with Vietnamese firms were few in number due to the lack of capacity on the part of these firms to do the type of construction required. These small, Vietnam-based firms were used primarily for small projects at outlying locations where it was not feasible for cost and security reasons to utilize the major contractor consortium.

It was only near the end of United States involvement that the Command began to award an increasing number of fixed price contracts to local firms in an effort to help the Vietnamese further develop their construction capability and their economy.

Level of Effort

A major problem in Vietnamese construction was the estimation and control of costs. Cost estimation and allocation was a major undertaking in Vietnamese construction from the standpoint of the sheer size of the program alone. The inherent problems were greatly magnified by problems associated with authorization of equipment, contractor mobilization, advance material purchasing and other

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[55]Interview with Mr. L. Jones, NAVFAC Construction Program, Code 053B, 26 May 1975.

investment costs and finally by the very instability of the whole construction program.

A system of cost allocation that provided for monthly distribution of actual indirect costs against actual direct costs was used during the initial stages of contract construction in Vietnam. Additionally, indirect costs were structured against the various components of actual costs such as camp construction and operation, general indirect costs, general overhead and fees. Mobilization and demobilization, equipment amortization and reserves for unused materials were also distributed on the basis of actual direct costs. With all these variable costs being distributed against a fluctuating base, project cost and the resultant current working estimates varied significantly and continuously.[56]

The expansion of the war in 1965 greatly increased the requirements of the various construction customers and this put a tremendous strain on the then existing construction program. By late spring of 1966, the major construction consortium, RMK-BRJ, had an extremely large backlog of work. The customers for this work, concerned over the delay, brought pressure to bear on the Officer in Charge of Construction. Often the various service customers did not realize that the contractor could not proceed because of factors beyond his control. During this time period, the Command, using some preliminary cash flow projections and construction

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[56]Gahart, p. 55.

time estimates, discovered that there was evidence that there might not be sufficient funds to complete the entire program.[57] As there was yet insufficient data, the Command decided to wait until the contractor had sufficient designs on hand to price out the program. By June 1966, the contractor had prepared total probable cost estimates. When the Officer in Charge of Construction evaluated these it was determined that an additional $200 million would be required to finish the projects requested by the customers at their present designed scope. When the customers were apprised of the problem and realized that many of these projects could not be built with the funds then available, they tended to blame the contractor and the Officer in Charge of Construction for the higher costs and construction delays.

The Command sent Captain Donald G. Iselin, CEC, USN to Vietnam on a fact finding trip to identify the problem and formulate a solution. It was while on this trip that Captain Iselin coordinated and formalized the development of the basic concepts that would later evolve into the Level of Effort system of management control.[58]

It was determined that the Officer in Charge of Construction had been estimating all the requirements--manpower, material and equipment--for all the projects that the customers said they were

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[57]Tregaskis, p. 240.

[58]CAPT D. G. Iselin, CEC, USN, Trip Report, OICC RVN (4-14 Feb 1967).

going to submit to him. He then arranged to procure the necessary men, material and equipment both from local sources and from the United States so that each individual project could be completed when the customer said it would be needed. At its peak, such advance procurement raised a work force of over 50,000 men as well as $150 million worth of construction equipment and $200 million worth of material.[59]

Unfortunately, this advance massing of construction assets coupled with confusion generated by the three separate major programming systems that existed in Vietnam in 1966 led to a great many problems when projects had invariably to be modified or cancelled. Often, by the time the contractor got his labor force and the necessary equipment and material assembled in the designated project area, the customer's needs had changed, and the contractor had to mobilize for a different set of project criteria. Those projects that had not been changed were often hindered by other factors:[60] lack of particular materials, design problems, or unavailability of necessary real estate. When the personnel were available and the job was not ready, the personnel still had to be paid as they were under long-term contracts. Finally, for various reasons, many jobs were cancelled by the customers

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[59]Tregaskis, p. 335.

[60]Iselin, p. 5.

themselves after the contractor had assembled the material and human assets necessary to do the job.[61]

Thus, the $200 million underfunding resulted from trying to build up the assets necessary to execute all the projects in a construction program that was so fluid in its initial stages that many of the projects were later altered or dropped altogether. This left the contractors with no way to immediately employ the material and manpower that they had already acquired for these projects. Thus, a large portion of the allocated funds were expended to amass material and hire personnel, and was not translated directly into facilities. This was a factor that had not been foreseen by the programmers who had thought that funds would be directly translated into facilities.[62]

In June 1966, there was assembled a massive labor force and a massive stock pile of material which potentially could be translated into finished facilities. Unfortunately, the amassing of this construction potential had put the construction effort $200 million in the hole. Simply put, the planners had failed to account for the go-stop-change-cancel nature of the wartime construction effort and its effect on the giant Vietnam construction enterprise. This error was compounded by the protean shape of

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[61] Tregaskis, pp. 335-36.

[62] Ibid., p. 8.

the program. Cost estimates had been made on a program that was not definite but prone to rapid change.[63] The Officer in Charge of Construction had a work force and sufficient material and equipment. He could easily execute the outstanding projects if the customer only could guarantee him that the workload would not be changed--that is, projects altered or done away with at the last minute. To end the construction dilemma, it was necessary to solve the problem of specifically defining the workload, speeding up design, obtaining real estate clearances and providing a steady work flow to the contractor.[64]

The Command was able to get a $200 million supplemental appropriation from Congress. This allowed it to finish all outstanding jobs and take on $100 million of new projects thus receiving an additional $100 million. Since the Command had already amassed sufficient material and equipment for all conceivable eventualities, it would need only part of the $100 million received for the new projects (used to pay wages). The remainder could be applied to paying for the labor of projects already underway.[65]

A new execution system, the Level of Effort system, was subsequently evolved to avoid any further programming confusion which could result in construction delays and underfunding. Level of

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[63] Iselin, pp. 8-9.

[64] Tregaskis, p. 336.

[65] Ibid., p. 338.

Effort was a capability funding system. A given capability was arrived at and matched to a known workload to be accomplished in a specified period of time (see Chart 10-6). This construction capability was established at such a level that work would always be ready and waiting for the capability--the capability would not sometimes be idled as before. The previous system had called for the establishment of a capability that could achieve virtually anything. This resulted in a huge amount of capital being invested to produce a construction capability that was not always utilized to full capacity.

The new capability was more limited in scope. This meant reductions in both manpower, material and equipment during the 1967-1968 time frame. The result was that more capital was freed for actual construction purposes.[66]

Under the Level of Effort system, budgets were set up for each phase of contractor operations, including all elements of direct and indirect costs. All overhead and indirect costs were combined and were redistributed as a set percentage, which was then periodically revised to reflect actual experience. This system tended to stabilize both the project costs and the current working estimates. Actual costs were plotted against an obligation and expenditure plan to form a basis for management action. The

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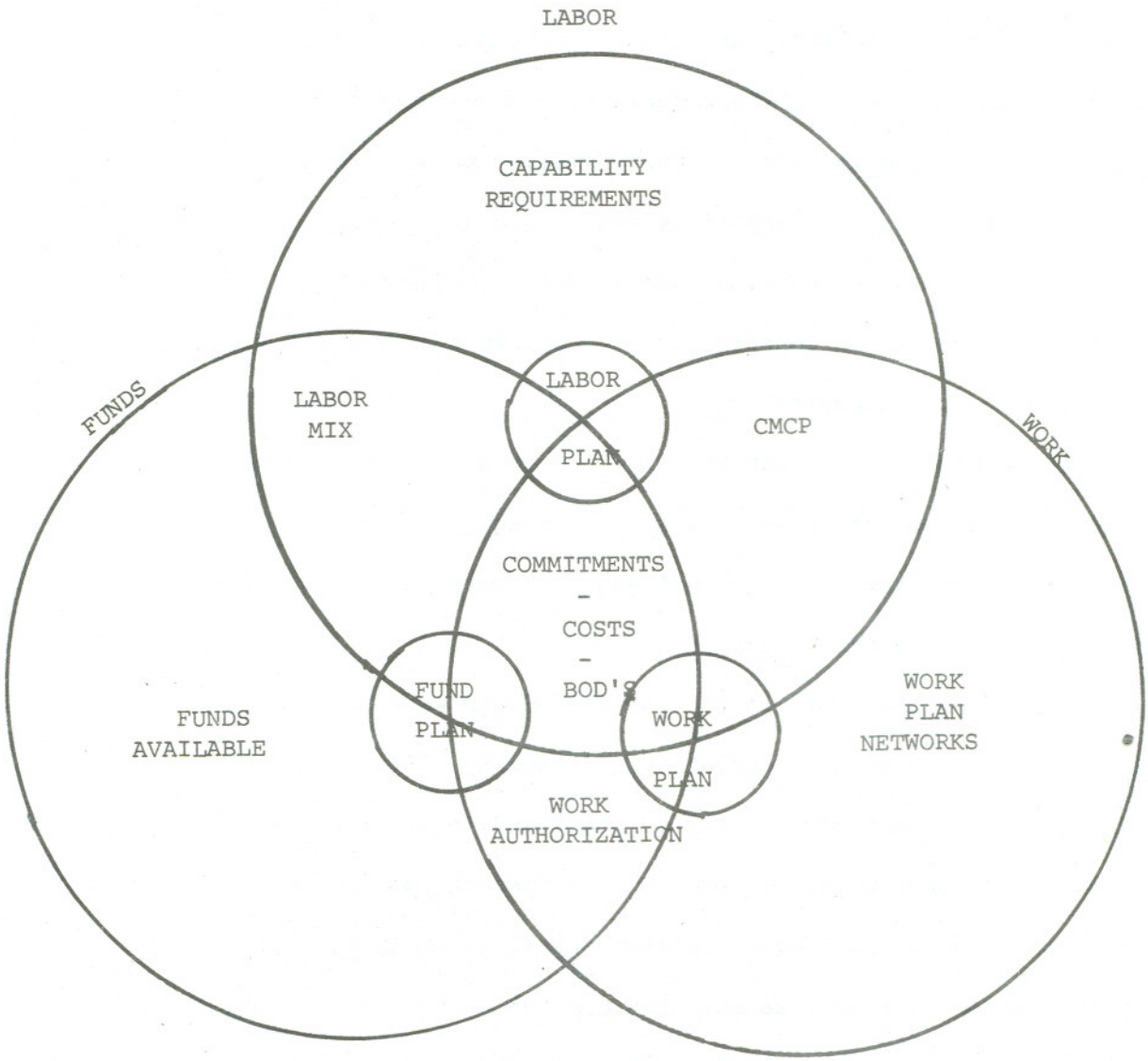
[66]Large amounts of excess material and equipment were sold to the Military Construction Forces.

CHART 10-6 THE "L-O-E" SYSTEM[67]




LEGEND:

LOE -- Level of Effort
BOD -- Beneficial Occupancy Date
CMCP -- Contractor's Manpower Capability Projection

[67]Tregaskis, figure 23, p. 341.

Level of Effort system allowed for control of contractor commitments at the earliest possible stage and provided information necessary for the distribution of indirect costs.[68] Under Level of Effort, the intense management of cash flow, workload and labor resulted in a stable program which permitted the contractor to achieve a high level of productivity.[69] The Level of Effort system continued as the principal construction management tool in Vietnam through the close-out of the contract in 1972.[70]

The Contractors

On 25 May 1961, an architectural and engineering firm, Thomas B. Bourne Associates, was awarded a $249,374 contract (NBy 32717) for the design of the first permanent jet-capable airfield in the Republic of Vietnam. This was the first large-scale design contract to be administered by the Navy in Vietnam. Within the next few months three additional contracts went to this same company.[71]

In July 1961, the Command was in the process of evaluating contractors previously utilized by the United States Operations Mission in Vietnam.[72] On 2 October 1961, the Command awarded

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[68]Gahart, pp. 55-56.

[69]Tregaskis, p. 342.

[70]Ibid., p. 350.

[71]Ibid., p. 23

[72]Ibid., pp. 23-24.

Tudor Engineering Company and Pacific Architects and Engineers, Inc. (a joint venture) a design contract for $279,955 (NBy 41519).[73]

By early 1962, the Command decided that contract construction work in Vietnam would be most efficiently carried out by a single large construction consortium, rather than by a multitude of independent companies. Chosen was a joint venture combine composed of two large construction companies with much experience in the field of heavy construction. These were Raymond International of New York and Morrison-Knudsen of Boise, Idaho. The Command awarded Contract NBy 44105 for $15 million worth of military construction to the consortium effective 19 January 1962.

In August 1965, Brown and Root, Inc. of Houston, Texas and the J.A. Jones Construction Company of Charlotte, North Carolina were brought into the consortium as new co-contractors. This combine of construction companies, the largest ever formed, was known collectively as RMK-BRJ. This single construction combine was responsible for the lion's share of heavy construction in Vietnam from 1962 through 1972.[74]

The RMK-BRJ consortium largely utilized native Vietnamese as its labor force. Americans and third country nationals were brought in to provide supervision. By the end of 1962, RMK-BRJ employed some 2,900 Vietnamese and 140 Americans and third country nationals

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[73] Tregaskis, p. 28.

[74] A History of the OICC Vietnam, p. 109.

and had placed the $15 million dollars worth of work called for. The original $15 million contract was then expanded to include a total military construction program valued at $49 million. This program ran through 1964. Work completed between 1962 and 1964 consisted primarily of airfield construction and rehabilitation, with roadwork and cantonment construction running a long second. By 1964 Work-in-Place ran from $1.3 to $1.5 million per month, reaching $16 million for the whole year.[75]

Beyond the planned $49 million of construction, prospects for further construction seemed unlikely, so the Command, through the Deputy Officer in Charge of Construction, Vietnam initiated a close-out study in late 1964, when the contractor's work was nearly completed. The close-out study, however, proved premature. The August 1964 Gulf of Tonkin incident began the sequence of events which led by 1965 and 1966 to massive direct American involvement in the war. Already, by September 1964, RMK was working on its first project in direct support of American forces.

The year 1965 saw drastic changes. To assist the Republic of Vietnam, President Lyndon B. Johnson decided to commit U.S. troops directly to the fighting. High U.S. officials visited Vietnam and instituted an all-out construction program to support these troops. An initial estimate by the Secretary of Defense placed the value of facilities needed in Vietnam at one billion dollars. Facilities

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[75]Tregaskis, p. 64.

requirements leaped ahead dramatically, the value of the work which had been constructed in three years would now be required as a monthly goal! Facilities for supporting combat troops had to be built as quickly and as economically as possible.[76]

Vietnam totally lacked facilities for the support of U.S. troops. Saigon was the only deep draft seaport. Most of the few existing airfields were not jet-capable. Only Tan Son Nhut, Bien Hoa, and Danang airfields offered limited capabilities, but no facilities for the support of a massive airlift delivery system of men and material. There were no cantonments to house and feed the troops. Electric power was not available in the quantities needed to support the sophisticated requirements of the U.S. Forces. Even water had to be made potable.

The construction challenge eventually extended well beyond the direct support requirements and evolved into a two-sided building program, construction of facilities in war which would also serve in peace. Many facilities built to support the war effort could also be used to help develop a modern economy in Vietnam.[77] Civilian contractors, used for the first time on such a scale in a combat zone, accounted for more than 60 percent of the construction accomplished in Vietnam with the Navy's Seabees, and Army, Marine and Air Force engineering personnel accomplishing the remainder.

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[76]Information from Mr. L. Jones, NAVFAC Construction, Code 053B.

[77]Ibid.

By 1965 and 1966, the consortium's capability had grown enormously. The work force expanded tremendously during these years. The greatest number of RMK-BRJ employees working at any one time was nearly 51,000 during July 1966. This roughly broke down to 4,000 Americans, 6,000 third country nationals and more than 40,000 Vietnamese. The highest production achieved by this work force was in March 1967 when $63 million worth of work was completed.

During the decade it was in existence the contractor consortium employed more than 200,000 workers. Some Vietnamese workers were hired two, three or four times since they preferred to stay at home and not move with the work as is common in the United States. At all times at least 80 percent of the work force was Vietnamese.

By 1966 the consortium even had its own training schools which operated in cooperation with the Labor Department of the Republic of Vietnam. The RMK-BRJ construction combine provided construction training (both on-the-job and in schools) to approximately 150,000 South Vietnamese during the ten years that it was in action in Vietnam.[78]

There were no locally manufactured construction materials or supplies in Vietnam for the massive building program. A lead time of six months to a year became part of the planning for the procurement of all materials. Anything from plumbing fixtures

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[78]Tregaskis, p. 224.

to door knobs had to be shipped, sometimes 12,000 miles, first across the United States and then across the Pacific Ocean to Vietnam. To sustain this construction effort, equipment valued at $208 million, after having been transported up to 12,000 miles, was distributed to seventy-five construction camps and hundreds of smaller building sites by land, sea and air transport. There were 143,500 separate spare parts classifications valued at nearly $90 million and 28,000 individual material stock items valued at over $426 million used in the construction effort.

The size of the overall contract, the numbers of personnel, volume of supplies, equipment, material and the funding problems handled by the Officer in Charge of Construction required a computerized system for complete control. Conventional accounting methods buried employees in volumes of paperwork, and were unresponsive to the needs of management. A crash program computerized all basic systems: the ordering, stocking, accounting and reorder of supplies and equipment; identification of all projects built, their component parts and materials used, cost and progress; the identification of equipment, its location, use and the scheduling of its maintenance; monitoring the overall financial management of the entire contract; and preparing payrolls and personnel rosters.[79]

This data processing system, started in 1965 and operational in 1966, opened a completely new field to Vietnamese employees.

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[79]Jones information.

Eighty Vietnamese were employed in the operation, and eventually seven became computer programmers. The system developed to train the personnel was borrowed and used by the United States Agency for International Development and the Vietnamese Ministry of Labor to train their own personnel.[80]

There were problems, especially during the period of rapid growth which took place in 1965 and 1966. A rapid expansion made supply acquisition difficult during this period. When supplies did arrive, the ships that carried them had long waits for unloading, because of inadequate port facilities. Labor problems also plagued the consortium. On several occasions the consortium's native Vietnamese workers struck en masse for a short period of time. Seabees and Marines had to be called in to replace the striking workers. The Tet offensive of 1968 was also disruptive. Much of the Vietnamese labor force disappeared until the offensive was quelled by U.S. forces. Those workers who did show up were not allowed on the bases until the emergency had passed. Despite these and other obstacles the consortium performed prodigious feats of construction during the period it was in Vietnam.[81]

The gigantic civilian contractor operation that the U.S. Government employed in Vietnam did not of course pass through the war unscathed. The first recorded casualty that the contractors

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[80]Jones information.

[81]Tregaskis, p. 383.

suffered was in October 1963. During the ten years that the contractors remained in action they suffered a total of 52 employees killed and 248 wounded as a result of enemy action.[82] One of the most severe instances was the wounding of 28 workmen when the truck they were riding in hit a mine near Danang East in November 1966. One of the heaviest losses of life in a single incident took place on 27 April 1966; 7 workmen were killed when a claymore mine exploded near the main gate of Tan Son Nhut Air Base. Contractors losses of major equipment damaged or destroyed and the cost of construction delays as a result of hostile enemy action was well over $5 million by 1967 alone.[83]

All told, the joint contractor venture did 550 million man-hours of work and they did it with an accident rate four times less than that experienced on construction projects in the United States. From 1966 onward, the joint contractors operated a medical staff of 130 employees and performed services from sick call to laboratory examinations and administered over two million innoculations.

It has been claimed that a total of 805,000 people visited the Saigon main office during the decade that RMK-BRJ was in business. This office, through one of the largest private communications systems in the world including voice and teletype communications and

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[82]In addition to RMK-BRJ fatalaties, three civilian employees from the staff of the OICC, Vietnam were also killed during the war.

[83]Jones information; Memo from COMNAVFAC to CNM of 27 Jul 1967, subj: Item for weekly NDC meeting.

job site radio communication networks, coordinated the consortium's effort in Vietnam. During their years in Vietnam, the joint contractors maintained over six million square feet of covered and open storage containing the materials and supplies that were used in their various construction projects. RMK-BRJ even had a fleet which at one time numbered more than 200 craft and 13 dredges. The contractors also made use of thirteen chartered airplanes. During the war years, these planes carried 421,000 passengers and sixty-one million pounds of material, supplies and equipment. In addition, the contractors had 1,244 trucks with a carrying capacity of between two and thirty-five tons.[84]

From 1962 through 1972, RMK-BRJ built fifteen jet-capable airfields (eight of which became major bases), as well as numerous other smaller airfields, seven deep draft ports with twenty deep draft berths and hundreds of lesser ports and thousands of feet of small craft wharfing facilities, more than three million barrels of POL storage, cantonment facilities for over 350,000 troops, new hospitals with a total capacity of over 8,000 beds, fifty-six million square feet of covered and open storage areas, 2.5 million cubic feet of cold storage areas, over 1,000 kilometers of improved streets, roads and highways, 8,300 lineal meters of new bridges and over fifty miles of railroad lines. During the life span of contract NBy 44105 a total of $1.9 billion worth of work was

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[84]Jones information; Memo from COMNAVFAC to CNM of 27 Jul 1967.

completed. The Command finally closed out the contract in July 1972, only three months before it closed down the office of the Officer in Charge of Construction, Vietnam.

The Other Contractors

Although the largest, RMK-BRJ was not the only contractor in Vietnam. Other major contractors were Philco-Ford, Pacific Architects and Engineers, and the Vinnell Corporation. Philco-Ford, under a cost plus award fee contract carried out maintenance and repairs on facilities and equipment in the I Corps area of Vietnam. From its inception in 1966 this contract averaged about $20 million a year. The contract was initially administered by the Naval Support Activity at Danang. On 1 July 1970 the Army took over common support responsibility in I Corps, and it retained the contract until 30 June 1971. At this point an existing Army maintenance contractor, Pacific Architects and Engineers took over Philco-Ford's function in I Corps.

Pacific Architects and Engineer's contract, also cost plus award fee, was initially signed in 1963. The contract peaked at $100 million and in 1968 Pacific Architects and Engineers had a total of 24,000 employees in Vietnam. The Vinnel Corporation had been under contract to the Army since 1966. It specialized in electrical power generation and distribution systems. Contract costs ran approximately $8 million per year.[85]

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[85]Tregaskis, p. 224.

Other firms in Southeast Asia during the Vietnamese War period were Utah-Martin-Day, Dillingham-Zachary-Kaiser, Black Corporation, Control Data Corporation, Collins Radio, Fischbeck and Moore, DeLong Corporation, Walter Kidde Company, Climate Control, Information Systems, Roscoe-Morse, and Kong Yong Enterprises of Korea. Fischbeck and Moore, Inc. of Dallas, Texas was a sub-contractor for electrical work and Kong Yong Enterprises of Korea handled some camp construction for RMK-BRJ and several lump sum contracts. Control Data Corporation of Minneapolis, Minnesota was responsible for computer operations and maintenance, Information Services Company for construction scheduling services, and Collins Radio of Dallas, Texas was responsible for two large communications installations.

Military Construction Forces

Although most of the construction in Vietnam was done by civilian contractors a significant portion was carried out by military engineer force personnel. Although the volume of work accomplished was less than that done by the contractors, the importance of the projects and conditions under which they were accomplished make the contribution of military construction personnel particularly significant.

The military construction personnel involved in Vietnam were from all the services: Navy Seabees, and Marine, Army and Air Force Engineer units. Perhaps the first to become involved in Vietnam

were the Seabees. As early as 1954, Seabees from Amphibious Construction Battalion 1 were in Vietnam building refugee camps. Beginning in 1962 and lasting until late 1965, Seabee Teams were active in Vietnam building bases for the Green Berets. Despite these early examples of military engineer activity, military engineers were not committed in large numbers in Vietnam until 1965 and 1966.

In May and June of 1965, Naval Mobile Construction Battalions 10 and 3 (these two battalions formed the Thirtieth Naval Construction Regiment which was established for Vietnam) arrived at Danang. These were the first of many Seabee battalions to serve in Vietnam during the period 1965-1972.[86] Such battalions had a complement of 738 men and 24 officers.

The engineer personnel of the other services began to enter Vietnam during this same period. Army engineer battalions were of two kinds, combat and construction. Combat Engineer Battalions carried out mine-clearance and demolition work and had a complement of 41 officers and 758 enlisted men. Army Construction Engineer Battalions engaged in heavy construction on camps, airfields, bridges and so forth. They corresponded most closely in function to the Mobile Construction Battalions, just as the Combat Engineer Battalions corresponded to the Marine Engineering Battalions.[87]

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[86]Tregaskis, p. 157.

[87]Ibid., pp. 157-158.

In 1966, the Air Force introduced RED HORSE personnel into Vietnam. RED HORSE stood for Rapid Engineer Deployable Heavy Operational Repair Squadron Engineering. Each RED HORSE unit had a complement of 384 enlisted men and 16 officers. They were unique among military engineer units in that they employed large numbers of Vietnamese workers which greatly expanded their construction capability. Prior to the 1966 deployment of RED HORSE units to Vietnam, the Air Force had sent in smaller teams of Engineers called PRIME BEEF (Prime Base Engineer Emergency Force). These were drawn from Base Maintenance Units in the United States and were sent to Vietnam to handle maintenance needs at the new air bases there. These teams consisted of 1 officer and 59 enlisted men plus up to 300 local civilian workers paid out of operations and maintenance funds.[88]

The Seabee battalions and the Army and Marine engineer battalions were primarily engaged in construction in the northern region of the Republic of Vietnam. This was the least populated and most rugged part of the country where most of the fighting was taking place. The Naval Mobile Construction Battalions and Marine Engineering Battalions were mainly located in the I Corps region. The Army engineer battalions were assigned jobs in II and III Corps areas while the Air Force RED HORSE squadrons were stationed at the major air force bases. Five RED HORSE squadrons with a combined strength of 2,000 men were located in Vietnam.

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[88]Tregaskis, p. 158.

By mid-1966, the number of Naval Mobile Construction Battalions in Vietnam had grown to seven. These were organized as the Third Naval Construction Brigade under the command of a rear admiral, who was also Deputy Commander, Pacific Division of the Naval Facilities Engineering Command in Southeast Asia.[89]

Military engineer strength in Vietnam peaked in 1968. There were twelve Navy Seabee battalions, five Marine engineer battalions, thirty-eight Army engineer battalions (plus forty-eight separate companies and numerous teams and detachments), and five Air Force RED HORSE squadrons, a total of 55,000 men. Most of these military engineer units were still concentrated in the northern half of the Republic of Vietnam.[90] All of the Seabee battalions had their headquarters and most of their personnel in the north, with nearly half of the battalions located in the northern part of the I Corps area, near the border with North Vietnam.[91] The Seabee battalions were mainly employed in building waterfront facilities, cantonments, storage areas, ammunition dumps, roads and bridges.

The Thirtieth Naval Construction Regiment was headquartered in Danang and the Thirty-second Naval Construction Regiment had its headquarters at Gia Le, near Hue. Together these two commands made up the Third Naval Construction Brigade with headquarters at Red Beach in the Danang complex.

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[89]Tregaskis, p. 158.

[90]Ibid., p. 297.

[91]Ibid., p. 351.

In December 1968, President-elect Richard M. Nixon first publicly announced the concept of "Vietnamization." Vietnamization in its narrowest sense consisted of the training and preparation of Vietnamese military personnel so that they could take over the burden of fighting the war. As the capability of the Vietnamese increased, they were given an increasingly greater role in the fighting, thus freeing United States military personnel to be returned home.

The Command's role in the Vietnamization process primarily consisted of building bases and dependent housing for the Vietnamese Navy. Seabee personnel were used to carry out the program. There was also concern that the Vietnamese Navy be trained in such building skills so that after the departure of United States military personnel they might be capable of effectively augmenting the facilities left to them. For the purpose of providing such training the Command organized Naval Construction Action Teams to work alongside Vietnamese naval personnel and teach them building skills. These Naval Construction Action Teams, or NAVCATS, represented an expansion of the original Seabee Team concept which had been successfully used in Southeast Asia for many years.[92]

On 14 May 1969, President Richard M. Nixon proposed withdrawing the greater part of all United States military personnel from Vietnam within a year. On 8 June 1969, he announced that the first increment

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[92]Tregaskis, p. 403.

of this withdrawal, totaling some 25,000 troops, would be complete by 31 August 1969. On 16 September a further withdrawal of 35,000 men was announced. Budgeting cuts in Vietnam spending, totaling some $3.5 million, were also enacted.[93]

The withdrawals and budgeting cuts forced a review of construction requirements. By June of 1969 such a review was being carried out by the Third Marine Amphibious Force and the Army's XXIV Corps, the major commands supported by the Third Naval Construction Brigade. Concurrently every effort was being made to determine the construction requirements of the Vietnamese Army, Navy and Air Force under the Vietnamization Program.

As a result of these reviews, it became obvious by August 1969, that the forecast ongoing workload could not sustain the effective construction capability of ten Mobile Construction Battalions. Thus, plans were made for the withdrawal of five battalions and one regimental staff. This reduction dovetailed nicely with the troop withdrawal announced by President Nixon during the following month.[94]

Battalion reassignments began in late September 1969 and were completed by December. The Thirtieth Naval Construction Regiment's headquarters was transferred to Okinawa and the headquarters of the Thirty-second Naval Construction Regiment was moved from Gia Le to Camp Haskins near Danang. On 1 March 1970, the Thirty-second

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[93]Tregaskis, p. 403.

[94]Ibid., p. 416.

Naval Construction Regiment assumed the functions of the Third Naval Construction Brigade which was subsequently phased out. There remained a brigade commander in Vietnam, but this function was assumed as an additional duty by the Officer in Charge of Construction, Vietnam. A material management program was implemented to coincide with the phase-down of military construction. This program saved an estimated $25 million that might have been spent on procurement of construction materials that were no longer needed because of the phase-down. The reductions in Naval Construction Force personnel resulted in the closing of five individual construction battalion camps and the relocation of construction materials from them to other battalions or to the Third Brigade material yard at Danang. In addition, two rock quarry and crusher sites and three asphalt plants were closed.[95]

During the 1970-1971 phase down period, the remaining Naval Construction Force personnel shifted their efforts to construction of permanent facilities in support of the Vietnamization Program. This effort centered on completing road work, permanent bridge and airfield construction and the erection of prefabricated buildings for the Forces Structural Increase Program to upgrade the capabilities of the Regional and Popular Forces.[96]

The final withdrawals of Naval Construction Force personnel took place in late 1971 and early 1972. On 7 November 1971, Naval

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[95] Tregaskis, pp. 416-417.

[96] Ibid.

Mobile Construction Battalion 5, the last Seabee battalion in Vietnam, departed for Guam. This left but four Seabee Teams remaining in Vietnam. The last of these departed on 30 April 1972, bringing the participation of Naval Construction Force personnel to an end in the Republic of Vietnam. The phase-down of Army, Marine and Air Force engineer troops had proceeded concurrently with that of the Navy's so that by the end of 1972, the number of remaining engineer personnel was negligible.

Projects

During the period 1962-1972, the Naval Facilities Engineering Command built or supervised the building of major combat bases in Vietnam at Danang, Chu Lai, Qui Nhon, Phu Cat, Pleiku, Nha Trang, Cam Ranh Bay, Phan Rang, Tan Son Nhut, Bien Hoa, Dong Tam, Tang Binh and Can Tho, to name but a few. These bases included complete military cantonments, ammunition storage areas, supply depots, airfields, aircraft maintenance facilities, aircraft parking aprons, helicopter pads, basic water-sanitation-power utilities, and a wide variety of auxiliary facilities. Of these bases, the installations at Danang, Phu Cat, Cam Ranh Bay, Bien Hoa, Tan Son Nhut, Phan Rang, Nha Trang and Chu Lai had runways capable of handling jet planes. The largest United States installations serving as major logistical centers, were the bases at Danang, Qui Nhon, Cam Ranh Bay, Saigon and Vung Tau.

Aside from these major military bases, other construction in Vietnam consisted of highways, cantonments for advisory groups,

living and maintenance installations for Market Time and Game Warden waterway patrol operations, and site and formation work for the integrated Widebranch Communications System radar installations. Other projects included the construction of the United States Embassy in Saigon, the headquarters building of the Military Assistance Command, Vietnam at Tan Son Nhut, the Naval Communications Stations at Cam Ranh and Danang, the complex at Tang Binh and the port facilities and petroleum storage facilities at Cam Ranh Bay.

Countless individual construction projects were carried out by civilian contractors and military engineers during the Vietnamese conflict. From 1962 until 1964 most construction was for air facilities. Construction on roads and cantonments had been minor by comparison. The contractor built or rehabilitated airfields at Bien Hoa (1961), Danang (1962) Tan Son Nhut (1962), Pleiku (1962), Loc Trang (1963), Vung Tan (1963) and Nha Trang (1963) to name a few of the major projects. At Cam Ranh, harbor facilities for deep water ships were built (1963) and at Can Tho an ammunition depot (1964) was constructed.

The beginning of direct United States participation in the fighting during 1965, led to greatly increased construction needs. Projects previously begun were augmented and new projects were initiated, all to provide proper support facilities for the hundreds of thousands of American troops which entered Vietnam during 1965 and 1966.

During the first two years of massive involvement, eleven overcrowded provincial hospitals were remodeled and renovated. Although this construction was done under the aegis of the Agency for International Development, it was monitored by the Naval Facilities Engineering Command. Among the hospitals that were built were three Army funded civilian war casualty hospitals located at Danang, Chu Lai, and Can Tho. Most construction was centered in the port cities where expanded port facilities, cantonments and air bases were built at top speed.

Most impressive were the airfield construction projects. In a crash program of 1965, the contractor built a 10,000 foot "interim" airfield in only sixty-six days at Cam Ranh Bay. The project was begun on 25 July, the first plane landed on 30 September, and by 1 November 1965, the air base was fully operational. This was a large undertaking as the whole project resulted in the laying of 634,000 square yards of parking apron and taxiways. Similar airfield complexes were built at Phu Cat and Danang during 1966 and 1967. By mid-1966, Saigon, Cam Ranh, and Danang (along with Utapao and Sattahip in Thailand) were the busiest centers of construction in the whole world.[97]

In Saigon during 1966, a pier and wharf complex was built at Newport. It involved four barge wharfs, two LST slips with ramps, and LCM and LSV ramps. By July 1967, the pier structure, with four berths and two transit sheds, was completed.

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[97]Tregaskis, p. 240.

During a three month period beginning in July 1966, Long Binh became a major center of construction. Long Binh was developed as the major Army storage and depot facility in Vietnam. When completed it was a huge complex of office, storage, and maintenance buildings covering some eighteen square miles.

Thu Doc, near Saigon, was similarly developed as a major storage and maintenance area, but for the use of the contractor consortium rather than the military. The initial plans for Thu Doc called for 4.4 million square feet of stabilized area, 38,000 square feet of covered shop area and 160,000 square feet of warehouses.[98]

Two other important building projects during 1966 in the Saigon area were the United States Embassy in Saigon proper and Military Assistance Command, Vietnam headquarters at Tan Son Nhut airport. In addition to construction at new sites, facilities at old sites, such as Bien Hoa, Cam Ranh, and Danang, were expanded tremendously during 1966 in order to meet the new exigencies of a wider war.

At Danang East, the contractors built a Navy Support Activity base and at Danang itself they installed the prefabricated piers for an "instant port" during July 1966. Deep water ports were scarce in Vietnam during the first years of American involvement and their lack was one of the chief reasons that supplies coming into Vietnam were bottlenecked. The contractors developed a

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[98]Tregaskis, p. 248.

method for prefabricating piers and installing them quickly where needed. Such ports were dubbed "ports-a-go-go" or "instant ports" and deep water ports were quickly built at Danang, Qui Nhon, Cam Ranh, Saigon and Vung Tau. The construction of these "instant" deep water ports constituted the largest single project of 1966.

In addition to building piers, extensive dredging had to be done at the prospective deep water ports in order to make them operational. The amount of dredging could not be precisely predicted because port facility plans (requirements) were lacking at the beginning of the period of massive United States involvement. Thus it became necessary to mobilize a large dredge fleet in the shortest possible time. The Officer in Charge of Construction solicited worldwide, and acquired dredges after an average elapsed time of only one and one-half months. He acquired these dredges from the United States, Canada and the Pacific Ocean area. At the height of the dredging operations, during the latter part of 1966, fifteen dredges were in operation. Support and management of the dredge fleet by a private contractor allowed maximum flexibility in its use.

After the deep water ports, the project next in magnitude was the construction of the Danang airbases: Danang Main, and the Marble Mountain facility. By the end of 1966, Danang's airport was the third busiest in the world, after those of Chicago and Saigon. A great deal of other expansion also went on at Danang

during the last half of 1966, especially in the troop billeting area.[99]

Barracks facilities at Pleiku were expanded during 1966 and 1967 and a 400 bed hospital was also built. In May 1966 construction of a major air base at Phu Cat was begun. During the 1966 and 1967 time period, the facilities at Qui Nhon were greatly expanded, turning the site into one of the major base cities of South Vietnam. In 1966 the air field at Nhu Trang was expanded and extensive storage facilities were constructed for the First Logistical Command. The Eighth Field Hospital was also expanded.[100]

Farther south, at Phan Rang, a new air base was built and at Nha Be, southeast of Saigon, a base was built for the Game Warden waterway patrol force. Southeast of Vung Tau, facilities were enlarged and a deep water port was developed. At Cat Lo, near Vung Tau, another Game Warden base was built. Additional bases were constructed, using dredges, at Dong Tam and My Tho to the south.[101]

Thirty miles south of My Tho, at Vinh Long, a helicopter airfield and a cantonment were built. The biggest job in the Delta region of Vietnam that the Command supervised was the construction in the Can Tho region. Here the contractor built a base for riverine operations. This was followed by the modernization of the airbase at Binh Thuy to the west.

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[99] Tregaskis, p. 250.

[100] Ibid., p. 288.

[101] Ibid., p. 292.

Also during the 1966-1967 period, the contractors built air bases on the Vietnamese islands of An Thoi and Phu Quoc, located in the Gulf of Thailand.

By March 1967, a high point for monthly Work-in-Place was attained when $63 million was put in. The monthly goal was only $40 million. By February 1967, the staff of the Officer in Charge of Construction had risen to 1,050 which included 90 Civil Engineer Corps officers. Construction was going forward at forty-seven different sites--a total of 782 separate projects.[102]

As mentioned earlier the military construction troops which arrive in Vietnam from 1965 onward were largely employed in the I Corps area. They carried out numerous construction projects along the border of North and South Vietnam, at Chu Lai, Danang, Hue Phu Bai, Dong Ha, Khe Sanh, Con Thien, Chu Viet and Quang Tri. This construction consisted of cantonments, air fields, helicopter pads, warehouses, bridges, roads, and so forth.

The offensive of 1968 delayed planned construction by approximately one month and made clear a major United States deficiency, the lack of adequately protected aircraft parking. Both the contractors and military engineer troops set about remedying this situation by construction "Wonder Arch" shelters during the remainder of 1968 and 1969.[103]

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[102]Tregaskis, p. 288.

[103]Ibid., p. 389.

A major task given the Seabees during 1968 was the execution of a new program called MER (Minimum Essential Requirements). MER was designed to provide Army personnel with dry, semi-permanent quarters to replace their temporary tent camps. This constituted one of the biggest Seabee projects of the war. Over 5,000 structures were put in place between August and November 1968.[104]

The Seabees were also busy with other essential projects during 1968. They were instrumental in repairing damage incurred during the Tet offensive. Among their many projects was the upgrading of nine helicopter bases and the construction of an ammunition supply point at Danang. At Red Beach, Danang they built the biggest (124 acres) helicopter base in Asia in only twenty-eight days. They also constructed 237.8 miles of roads in the I Corps region. They built POL storage facilities for 167,000 gallons of fuel, and 425,000 square feet of covered storage. They also constructed ammunition dumps and supply points at Chu Lai, Dong Ha, Danang, Phu Bai, Khe Sanh, Camp Evans, and Quang Tri.

The Vietnamization Program with its goal of making the South Vietnamese self-sufficient in both the military and economic sense opened the last great era of construction in Vietnam. The projects involved in Vietnamization kept work levels high, although

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[104]Tregaskis, p. 392.

there were progressively fewer and fewer American troops in Vietnam from 1969 onward.

The Command was deeply involved during 1969 and 1970 in a program to increase the strength of the Vietnamese Navy by building new bases and expanding old ones throughout Vietnam. Thirty-three bases were to be built, with eleven bases having priority. The contractor built some of these bases; those at Ben Luc, My Tho and Cat Lo. The Seabees built others, including those at Ha Tien, Rach Soi, Long Phu and Nam Canh. It was during this period that Seabees moved in battalion strength into the Delta.[105]

The last major construction effort during the United States involvement in the war, was the Line of Communications (LOC) Project. This project was for the purpose of upgrading the road, railroad and inland waterway networks to enhance communications within the country. Good communications were considered the single biggest asset for driving out Viet Cong insurgents who thrived by isolating the government from the people. The LOC Project began in 1969 and involved both military and civilian engineers. In 1969, a half billion dollars was slated for road construction. The design effort alone totaled $15 million. During 1969, the road network in the Delta region was emphasized. The following year emphasis shifted to the highland and coastal road networks.

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[105]Tregaskis, p. 404.

The Seabee road building program in the I Corps area was finished on schedule in October 1969, despite intense enemy opposition. This was the biggest single Seabee job of the war.[106]

An additional $15 million was slated for the restoration of the country's railroad system. The Riverine Program with its emphasis on waterways security tied in with the LOC Program. The final phase of the LOC Program took place during 1971 and 1972. The inland segements of road construction were completed and some of the equipment used was turned over to ARVN military engineers.

With all construction completed the last Seabees left Vietnam on 30 April 1972. The contractor was soon to follow, with the completion date of contract NBy 44105 set for 30 June 1972.

CHART 10-7 MILCON CONSTRUCTION IN VIETNAM
(Excluding O&M)

| | Contract | Troop | Total |
|---|---|---|---|
| Army | $714,472,000 | $221,840,000 | $1,770,969,000 for all three services |
| Navy | 361,602,000 | 73,967,000 | |
| Air Force | 377,994,000 | 21,094,000 | |
| | $1,454,068,000 | $316,901,000 | |

The above represents total U.S. MILCON expenditures from the beginning of U.S. participation. Although MILCON funding accounted for most Vietnam construction, there were also numerous projects funded from Operations and Maintenance funds.

[106] Tregaskis, p. 414.

CHART 10-8 SUMMARY OF CONSTRUCTION RESOURCES[107]

| Army | Navy | Air Force | Other |
|---|---|---|---|
| | | Troops | |
| a. Two engineer brigades consisting of 13 combat battalions and 15 construction battalions. (Peak strength about 30,100) | a. A Seabee Brigade consisting of 12 NMCBs. (Peak strength about 10,000) | a. Five heavy repair (RED HORSE) squadrons. (Peak strength about 2,000) | a. Self-help--widely used by all services. |
| b. Various engineer utility detachments with the primary mission of facilities maintenance. (Peak strength about 1,450) | b. Public Works forces assigned to the Naval Support Activities at Danang and Saigon. (Peak strength about 2,500) | b. Base Civil Engineering forces at each of the Air Force bases to accomplish facilities maintenance. (Peak strength about 4,500) | b. Divisional Army and Marine Corps engineer battalions and Marine Corps Fleet Marine Force battalions assigned to III MAF. (Not included in troop strengths of the three other Services) |
| | | c. PRIME BEEF teams--small teams of Air Force officers and men deployed to RVN on a temporary duty basis to accomplish specific construction projects. (O&M funded) | |

[107]Tregaskis, figure 18, p. 247.

CHART 10-8 (Continued) SUMMARY OF CONSTRUCTION RESOURCES

| Army | Navy | Air Force | Other |
|---|---|---|---|
| | Contractors | | |
| a. Pacific Architects and Engineers (PA&E) --The Army's facilities maintenance contractor. (Peak strength about 24,000) | a. RMK-BRJ--the main construction contractor in RVN operating under the supervision of the Navy Officer in Charge of Construction (OICC) (Peak strength about 51,000) | a. Walter Kidde--turnkey contractor for Tuy Hoa Air Base | a. Various turnkey contractors for communications facilities--included Page, RCA, and Philco. |
| b. Vinnel Corporation--contractor for installation, operation, and maintenance of electrical systems--primarily T-2 tankers. | b. Philco-Ford--contractor providing a skilled third country national (TCN) labor force to the Public Works activities. This force together with the Seabees organic to the Public Works activities and a force of local nationals made up the Navy's facilities maintenance work force. (Peak strength about 6,000) | | b. Local contracting authority primarily funded with AIK funds--used extensively by the Army and the Navy to construct advisor facilities. |
| c. DeLong Corporation--installation and rehabilitation of DeLong Piers. | | | |

In the Far East the Naval Facilities Engineering Command did not limit its activity solely to Vietnam. The Command also played a significant role in Thailand, Cambodia, and Laos.

## THAILAND

Between 1964 and 1968, under the direction of the Officer in Charge of Construction, Thailand, civilian contractors built five important roads in that country. They were the North Security Road, and a three part highway project which connected the port of Sattahip with Korat in the northeast. As early as May 1963, design began on the two security roads. Construction began in February 1964 and the roads were completed in 1966. The cost was $10 million. Half the expense was borne by the Thai government and half by the United States government. The main roads were eight meters wide and the spurs five meters wide. The system had a total of 114 bridges, 125 box culverts, and 456 other culverts. The Thai Government Highway Department procured and cleared the necessary land, and the Officer in Charge of Construction, Thailand supervised the design and construction of this project. Thomas B. Bourne Associates, Inc. did design work on this project under contract. Construction was done by six Thai firms and Raymond International, Inc. of subsequent Vietnam fame.[108]

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[108]Anonymous, "Roads in Thailand," The Navy Civil Engineer, Vol. IX (Apr 1968), pp. 14-15.

As early as 1960, the Commander in Chief, Pacific had envisioned a three part highway link joining the port of Sattahip with Korat. The Officer in Charge of Construction began design for this project in 1961 and in 1962 actual construction commenced. In 1962, CINCPAC designated the 809th U.S. Army Engineer Battalion to work with Thai Army units on the first section of this project which was known as the Bangkok Bypass Road. Actual construction began in April and the road was dedicated on 25 March 1966. It was made of asphaltic concrete, was seven meters wide and had seven bridges. Two other links in this network were the Kabinburi-Korat Road, completed in 1966, and the Northerly Inland Road, completed in 1968. These roads promoted economic development and aided Thai national security. In total some 374 kilometers of road were built on this project (147 kilometers from Sattahip to Chachoengsao, 87 kilometers from Chachoengsao to Kabinburi, and 140 kilometers from Kabinburi to Korat).[109]

Effective 14 March 1966, the Naval Facilities Engineering Command awarded contracts to the joint venture combine of Dillingham-Zachary-Kaiser for construction of approximately $95 million worth of facilities. Another joint venture combine, Utah-Martin-Day, received a construction contract for $45 million. It was estimated that both contracts would require approximately 18 months to complete. Both contracts were cost plus award fee.[110]

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[109]"Roads in Thailand," pp. 14-15.

[110]LCDR Earl R. Seeber, CEC, USN, "Detailed Fund Control: OICC Thailand Detail Cost," The Navy Civil Engineer, Vol VIII (Sep 1967), p. 4-7.

The contractor costs and fees were considerable. Actual overhead costs for Utah-Martin-Day through 30 November 1966 were $3.3 million (contract NBy 63905). Actual overhead costs for Dillingham-Zachary-Kaiser through the same date ran $11.8 million. Utah-Martin-Day received a fixed fee of $211,757 for $10.1 million of construction and Dillingham-Zachary-Kaiser received $228,288 for $11.4 million. This award fee was based on contractor's performance and was not more than 4/9 of the fixed fee.[111]

The number of personnel employed by the construction contractors as of 30 November 1966 was 415 Americans, 80 third country nationals and 8,737 Thais. The number of personnel employed by architect and engineering contractors in Thailand on the same date was 142 Americans, 118 third country nationals and 547 Thais.[112]

Detailed control of funds and current cost reporting were mandatory for Thailand contracts. The Officer in Charge of Construction, Thailand evolved a budget system for evaluation and projection of project cost elements and direct costs (the direct costs were labor, material and equipment usage). The Officer in Charge of Construction was assisted in this by the Defense Contract Audit Agency and by the Command. The system allowed projects to be closed out fiscally at the earliest possible time, while still providing funds for the payment of actual bills not received at the time

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[111] Ltr from OICC Thailand to CDR USMACTHAI (J-4) (Ser 9356) of 20 Dec 1966, subj: Data for the Report on Visit of Mr. V.M. Rexroad.

[112] Ibid.

of the closeout. The Officer in Charge of Construction, in concert with each contractor, made quarterly evaluations of budgets and accounting balances to ensure their validity. In the event that a budget was found to be in error, it was jointly re-evaluated and the percentage revised as appropriate.[113]

The yearly average of Work-In-Place was approximately 23.5 million dollars from the establishment of the Officer in Charge of Construction, Thailand till March 1966. The work in place for fiscal year 1967 was approximately $105 million dollars.[114]

As early as February 1967, the Officer in Charge of Construction, Thailand was authorized to begin action toward the close out of the Utah-Martin-Day cost plus award contract under which construction of facilities was being carried out at Nam Phang and Korat in the "up country" part of Thailand. Complete close out on this project was planned for mid-summer 1967.

A major feat of United States construction in Thailand was the building of a $40 million deep water port at Sattahip, Thailand. Planning was initiated for this gigantic project in September 1965. Construction began in April 1966. Construction was done by the joint-contractor combine of Dillingham-Zachary-Kaiser. The four berth quay which became operational in January 1968, had a capacity of more than 80,000 short tons a month. Part of this port

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[113] LCDR Seeber, "Detailed Fund Control," pp. 4-7.

[114] Ibid., p. 4.

construction involved the building of a 3,600 foot long breakwater from Mu Island into the Gulf of Thailand.[115]

Other major projects in Thailand included the construction of the Utaopao Airport and of airbases, complete with all supporting facilities, at Udorn, Ubon, Nam Phang, Tak Hli and Korat. The Command also supervised construction of the Army's Logistics Command Headquarters ("Camp Friendship") at Korat. The Command was also responsible for the construction of Ramasan Station, an Army Security Agency base.[116]

CAMBODIA

In Cambodia the Command was responsible for upgrading existing facilities at three airfields: Pochentong (at Phnom Peng), Battam Bang, and Ream. Only the airfield work at Battam Bang was completed prior to the collapse of the Khmer Republic. A naval base was also to be constructed at Ream.[117]

LAOS

In Laos the Command upgraded existing facilities at two airfields, Wattang and Savannakhet. Some hospitals and schools were

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[115] Memo from COMNAVFAC to Deputy Chief of Staff for Logistics, Department of the Army of 8 Dec 1967, subj: Breakwater Phase II, Sattahip Port, Sattahip, Thailand.

[116] Interview with Mr. L. Jones, NAVFAC Construction, Code 053B, 22 May 1975.

[117] Ibid.

also built under the auspices of the Agency for International Development (AID).[118]

In addition to its effort in Southeast Asia, the Naval Facilities Engineering Command also executed numerous construction projects, both large and small, throughout the rest of the world.

NAVAL COMMUNICATION STATION, HAROLD E. HOLT (VLFPAC)

The Navy has the special problem of providing reliable communications over vast areas of ocean. To do this, it employs very low frequency (VLF) radio facilities, since VLF transmission is most efficient for communications over great distances. Additionally VLF transmission permits radio communication with submarines submerged at considerable depths, a feature of incalculable importance given the missile submarine's strategic role. An important link in the VLF network is the Naval Communication Station Harold E. Holt, at North West Cape, Australia.

Planning for the Very Low Frequency Naval Communications Station, North West Cape, Australia (the name was changed to Naval Communication Station, Harold E. Holt on 14 September 1968) began during the late 1950s, when the Navy, recognizing the need for better communications coverage in the Indian Ocean and Southwest Pacific areas, began a search for a suitable station site. After a thorough investigation, North West Cape, Australia was selected in 1961.

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[118]Jones interview.

The Command was made responsible for construction and an Officer in Charge of Construction was established in Perth in 1963. Ground was broken for the new project at North West Cape that same year.[119]

The actual construction was a joint Australian-American effort and was carried out by contractors and sub-contractors of both nations. The station is located on 18,000 acres in a very remote section of the state of Western Australia. This site presented staggering logistical problems, located as it is 750 miles from Perth, the nearest city. Initially the only link between the site and Perth was a dusty, dirt road.

This gigantic facility was divided into three major areas. Area "A", located at the extreme northern tip of the cape was known as the "Low Frequency Area." This area, 5,600 acres in size, contained the VLF transmitter facility consisting of the antenna and transmitter building. The antenna system dominated the area. It was composed of a complex of towers and antenna wire systems, resembling a six pointed star, approximately 8,400 feet in diameter. The elevated wires were supported at an average height of 900 feet by twelve towers arranged in a hexagonal pattern in two rows around a central thirteenth tower. This central tower was 1,296 feet high while the towers of the inner ring were 1,195

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[119] A Guide to NWC, the Very Low Frequency Transmitter and Helix Building (10 Nov 1966), p. 2.

feet high and those of the outer ring were 996 feet high. At the time of its construction the central tower was the tallest structure in the southern hemisphere. Although the shortest, the outer ring towers were still taller than the Eiffel Tower. These outermost towers of the complex were 1.56 miles apart. More than six miles of steel guy wires, nearly two inches in diameter, safeguarded the aerial maze against hurricane-force winds.

Also located in the VLF transmitter area were the pier and harbor facilities, oil storage, and the main power plant which was capable of producing approximately 18,000 kilowatts of electrical energy.

The second area, which was designated the "Administration and High Frequency Transmitting Area," comprised approximately 3,000 acres and was located about seven miles south of the low frequency site, on the Coast of the Gulf of Exmouth. This site contained bachelor officer and bachelor enlisted quarters, a naval exchange and other support facilities. In addition this site housed high frequency transmitter buildings, associated antennas, a communications center, and administration, storage and maintenance buildings.

The third site, known as the "High Frequency Receiver Area," was about 9,500 acres in extent and was located 30 miles from the Administration and High Frequency Transmitter Area. This area contained a high frequency receiving building, an antenna, a small

power plant and other necessary utilities.[120] The Command was responsible not only for the construction of base facilities, but also for the procurement and installation of the VLF transmitter and antenna. The Command's procurement responsibility also included design. Design of the transmitter and antenna system was done with the help of the Naval Electronics System Command.[121]

Construction was initially planned to take place in three increments over a three year period, with $30 million programmed for fiscal year 1965. The total cost was estimated at $70 million.

During the first two years, the VLF transmitter, the high frequency transmitting system and the administration, support and operations buildings, main power plant and pier were built. Because of high costs resulting from the remoteness of the site, as much work as possible was included in the initial bid package. To achieve this objective, lump sum contracting was used. Unique at this time, lump sum contracting would be used with great success during the Vietnam war construction effort.

The work was subdivided into components "A" and "B." The former contained items estimated to be worth 50 percent of the amount bid, and the latter the items still to be funded. The successful bidder was to commence work on "A" immediately, but upon "B" only when notified by the Command. The low bid for fiscal

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[120]Interview with CDR H.C. Sherrod and Mr. F.D. Jackson, NAVFAC Communications/Electronics Coordination Office, Codes PC-6 and PC-6A, 22 May 1975.

[121]Ibid.

year 1963 construction was $34.8 million; the contract was awarded on 19 July 1963.

An interesting sidelight on this project was the construction of the town of Exmouth. The construction site was so remote that there were no living or support facilities for the construction workers and their families. As a joint venture, the Navy and the Australian government built a town at a point south of the administration and service area. This town, named "Exmouth," was completely planned and provided housing, stores and schools for the construction personnel and their families.

Construction on the whole project came to a successful climax on 7 November 1966 when the first VLF signal was broadcast from North West Cape.[122]

ATLANTIC UNDERSEA TEST AND EVALUATION CENTER

Construction of the Atlantic Undersea Test and Evaluation Center in the Bahama Islands was an important Command project during fiscal years 1962-1967. The Atlantic Undersea Test and Evaluation Center, known as AUTEC, was built to perform operational evaluation of advanced undersea weapon systems and components, measurement of submerged tactical characteristics of submarines, measurement of submarine noise and acoustic submarine target

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[122]Sherrod and Jackson interview.

strength, calibration of large low frequency sonar transducers, testing of sonobuoys, evaluation of the anti-submarine attack effectiveness of aircraft, surface ships, and submarines in competitive-type training exercises. In addition AUTEC supported the research and development necessary for the advancement of the technologies and systems required for the more effective use of deep sea by the Navy.

The cost of the complete center was $125 million with $22.5 million from military construction funding sources and $102.5 million from other sources. The center was to be maintained and operated by Navy personnel with contractor employees on site during various evaluation tests. Facilities were provided for 25 officers, 50 civilians and 250 enlisted men. The center was self-sustained and logistics were based upon a fifteen day resupply cycle. Family housing was not initially authorized for personnel stationed at the center.[123]

Individual projects consisted of a pier, channel dredging, underwater tracking stations, telemetry, microwave and radar equipment as well as all the support facilities necessary for such an installation.

The total project was built during fiscal years 1962 through 1967 (the fiscal year 1967 military construction funding received an amended authorization in fiscal year 1969). The first and

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[123]"Atlantic Undersea Test and Evaluation Center" (undated point paper), from Mr. G. M. Pexton, NAVFAC Construction, Code 051PE.

second major construction increments were completed during 1966. This work included all required facilities at the main base and at five tracking stations and three navigation aid stations. Additional military construction programs were evolved for future fiscal years to provide further tracking stations as development of hardware proceeded. A project for air conditioning of personnel facilities was submitted for inclusion in the fiscal year 1967 program in the amount of $596,000.

All sites for the Atlantic Undersea Test and Evaluation Center were provided to the United States without charge in accordance with the United States-United Kingdom Country-to-Country Agreement dated 11 October 1963.[124]

## NAVAL ACADEMY MODERNIZATION

To enable the Naval Academy to keep pace with its demanding responsibilities, a continuous program of modernization and expansion was undertaken in 1965. The impetus and guidance for this program can be traced to the recommendations of the Special Advisory Commission of 1948 (known as the Manning Commission), and those of the Moreell Commission of 1961. Following the recommendations of these commissions the athletic facilities and the midshipman housing facilities were thoroughly modernized and expanded.[125]

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[124]"Atlantic Undersea Test and Evaluation Center."

[125]U.S. Naval Academy Master Plan: A Program of Modernization and Expansion of Academic Support Facilities, John Carl Warnecke and Associates, Architects and Planning Consultants (1965), p. 2.

An analysis of academy expansion since 1910 indicated that, in response to expanding enrollment, athletic facilities and midshipman housing had grown faster than academic facilities. As a result, the most pressing need at the Academy was for additional space. In response to this need, John Carl Warnecke and Associates were directed to prepare a master plan aimed primarily at the need for increased academic and support facilities but including overall plans for traffic, parking and landscaping. This plan, however, looked beyond these limits and coordinated the earlier modernization work with future construction in a manner commensurate with the Academy's high standards of efficiency and appearance.

It was found that 517,000 net square feet of space were needed for the academic departments. Discounting the obsolete mathematics building, the usable space totaled only 304,000 square feet. The deficit of 213,000 square feet had to be rectified by additional construction. It was decided that 30,000 square feet could be added to Mahan Hall (the library) by eliminating the inadequate and obsolete auditorium and converting this space to library use.[126] The remaining deficit of 183,000 square feet would be eliminated by the construction of an urgently needed science and mathematics facility.

In addition to the quantitative deficiency, the investigation revealed a qualitative space deficiency because the departments did

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[126]Naval Academy Master Plan, p. 4.

not have the type of space that was needed for their modernized curricula. Extensive renovation of existing academic buildings was proposed to remedy this problem. The existing auditorium was found to be inadequate in size and totally unsuitable in technical equipment and stage facilities. Construction of a new auditorium was recommended, one with a seating capacity of either 2,500 or 4,500 (the larger size could accommodate the whole brigade, although the smaller size would be more desirable for all other uses).[127]

Construction of a new science building, a new auditorium, and rehabilitation of the existing structures was thought at the time to be adequate for the provision of adequate facilities in the foreseeable future.

With the modernization and expansion of midshipman housing and athletic facilities already completed, the remaining problem was the provision of adequate and efficient support facilities. As with the academic department, the functions and size of support activities were expanding and changing in response to increasing enrollment. Unfortunately, the physical facilities in which they were housed had become obsolete and were, in many cases, badly located. High operating cost and inefficiency were the result.

The public works shops were scattered about the campus in dangerously overcrowded leftover spaces. These conditions led

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[127] Naval Academy Master Plan, p. 5.

CHART 10-9 ACADEMIC SPACE PROGRAM IN 1965 MASTER PLAN

| Department | Space Required | Present Location and Area | | Proposed Location and Area* | |
|---|---|---|---|---|---|
| Science | 142,345 | Sampson | 44,640 | Michelson | 142,000 |
| | | Mahan | 19,290 | | |
| Mathematics | 42,225 | Math Buildings | 21,330 | Michelson | 41,000 |
| Engineering | 119,965 | Isherwood, Griffin, Melville | 139,700 | Isherwood, Griffin, Melville | 119,100 |
| Naval Science | 54,791 | Luce | 55,650 | Luce | 50,000 |
| Weapons | 39,514 | Ward | 23,460 | Maury | 39,100** |
| English, History and Government | 49,155 | Maury | 46,150 | Sampson | 38,700 |
| Foreign Languages | 20,700 | Building 117 | 11,740 | Ward | 20,200 |
| Main Library | 57,980 | Mahan | 11,600 | Mahan | 57,000*** |
| Computer Center | - | - | | Building 117 | 10,100 |
| Total Department Needs | 526,675 | | - | | - |
| Less Duplication of General Classrooms | -9,600 | | - | | - |
| Total Academic Space Required | 517,075 | | | | |
| Existing | | | 373,560 | | 304,200 |
| New Space | | | | | 213,000 |
| Total Program | | | | | 517,200 |
| Auditorium | 90,000 | Mahan | 13,500 | New Auditorium | 90,000 |

*The net area of renovated buildings is decreased due to the increased space required for new mechanical equipment and required exits, together with the inefficiencies inherent in remodeling.

**English, History, and Government will share general classrooms located in other buildings.

***Mahan Hall renovation adds 30,000 net sq. ft. to structure. Conversion of use adds 15,000 sq. ft. additional to Library.

to equipment duplication and management difficulties. It was estimated that a centralized facility of 40,000 square feet would lower shop costs and increase safety. The laundry and dry cleaning facilities were located in two buildings that were cramped and unsuitable for the installation of modern equipment. One of the buildings was also structurally unsound. As there was no available commercial service that was capable or willing to provide the needed support, continuation of the then existing service at reasonable cost to the midshipman would require a new plant of 50,000 square feet. Other necessary support facilities were a new 5,900 square foot sailing center, and a new visitor reception center. The modernization of several administrative support facilities was also needed.[128]

The Naval Academy master plan was revised in 1966 and 1967 due to changes in the Academy's requirements resulting from changes in the curriculum as it adapted itself to the increasing demands of the fleet. Instead of a rennovation of the old library, Mahan Hall, a new central library was given top priority in the 1967 master plan.[129] Its ultimate capacity was to be 750,000 volumes and it would contain 150,230 net square feet. Library expansion was to be carried out in two stages. The immediate library need was

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[128] Naval Academy Master Plan, p. 8.

[129] U.S. Naval Academy Master Plan--1967, John Carl Warnecke and Associates, Architects and Planning Consultants (1967), p. 3.

119,000 square feet; the full area of the new building would only be required in fifteen or twenty years. In the interim, the new library building was to house the other educational services of the Academy, the computer center and the central studios for television.

A new engineering building was also programmed as the best way, both economically and functionally, to provide the facilities needed for the dynamically changing engineering curriculum. As renovation of the old Isherwood-Griffin-Melville engineering complex would cost almost as much as new construction, it was decided to build an entirely new engineering building.

The Weapons Department was the only other academic activity with new space demands that required an immediate modification of the 1965 master plan. The other departments would be able to carry out their mission by full utilization of the spaces assigned to them and by sharing, as planned, the new classrooms in Michelson Hall. The third major recommendation of the 1967 master plan, therefore, was to build new weapons laboratories in addition to the space previously programmed for the Weapons Department in Manz Hall. Other alterations were made in the 1965 plan affecting the location and size of the various support facilities projects that had been programmed.[130]

Fiscal year 1965 was the first year of the Naval Academy modernization plan. During that year $165,000 was spent on land

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[130] Naval Academy Master Plan--1967, pp. 3-4.

acquisition and $1.3 million on two construction line items. The land, consisting of seventeen acres, was acquired by June 1965. The construction work was done on the public works shops and on utilities. The work on the public works shops ran $897,000 and was completed in January 1967. The utilities work represented only the first increment of such work. It cost $436,000 and was completed in January 1968.[131]

During fiscal year 1966, $17 million was spent on military construction line items. The sum of $13.5 million was authorized for Michelson-Chauvenet Hall, the new science building. (It was completed in September 1968.) That same year $3.5 million was authorized for the central heating plant. This construction was subsequently deferred by the Secretary of Defense. The funds were finally released in January 1967. Bids were taken in March 1967 and a contract awarded in May. Construction took twenty-nine months with the project being completed in October 1969.[132]

In fiscal year 1967, $2.8 million was authorized on one military construction line item. This was the second increment of the utilities rehabilitation project and included work in the areas of power and water distribution, and sewage collection system changes. This project was completed by June 1970.[133]

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[131]"U.S. Naval Academy, Annapolis, Md.: Modernization Master Plan Status" (9 Feb 1972); Interview with Mr. R.S. Goodwin, NAVFAC Construction, Code 052PJ, 19 May 1975.

[132]Ibid.

[133]Ibid.

In fiscal year 1968, $3.3 million was authorized on two line items (an additional $300,000 was spent on the naval station sewage treatment plant). A total of $2.1 million was spent on Sampson Hall, the first increment of academic building modernization. The sum of $1.1 million was spent on the laundry and dry cleaning plant. Finally, $300,000 was spent on secondary treatment facilities for the existing sewage treatment plant at the naval station. This expenditure was not part of the Naval Academy Master Plan. Construction for these items took twenty-five months and was finished in July 1970.[134]

The fiscal year 1969 program involved $2 million being spent on land fill and site improvement. Construction was completed in May 1971.

During fiscal year 1970, $13.2 million was authorized on two military construction projects. The first of these was a library and education center. It was completed in October 1972 at a cost of $9.7 million. The second project of the year was the third increment of the utilities rehabilitation and expansion project. This increment cost $3.5 million and was completed in August 1971.[135]

The single large project of fiscal years 1971, 1972 and 1973 was the engineering studies complex. The first or main phase, costing $10 million, was awarded in February 1971; the second and

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[134]"Naval Academy: Modernization Master Plan Status," p. 2 of 3.

[135]Ibid.

third phases, costing $8.4 million and $9.3 million, was awarded in January 1973. All three phases were completed in December 1974. The fiscal year 1974 project was the rehabilitation of Maury Hall at a cost of $4.3 million.

The two fiscal year 1975 projects were the modernization and expansion of Ford Hall and landfill and site improvements. The first was authorized for $6.5 million in fiscal year 1975, but was not funded. It was expected that construction would begin about December 1975. The landfill project was originally an amended authorization for fiscal year 1969. Construction was expected to start in October 1975 and completion was predicted for September 1976. There were no Naval Academy modernization military construction projects programmed for fiscal year 1976.

In the planning stage were several projects which might get into the fiscal year 1977 program or some later year's program. These were the Dorsey Creek bridge at $2.5 million, the air-conditioned midshipmen's mess at $1.6 million, the fourth increment of utilities rehabilitation and expansion at $4.5 million, athletic center rehabilitation at approximately $1 million, and the rehabilitation of Building 117 (Visitor Information Center), Ward Hall and the Midshipmen's Reception Center, costing an estimated $859,000, $1.3 million and $672,000 respectively.

The total Naval Academy Modernization construction program would cost in excess of $100,000 million when completed.[136]

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[136]"Naval Academy: Modernization Master Plan Status," p. 3 of 3.

A final piece of construction, not part of the Naval Academy master plan, was the construction of the Sailing Center. The cost of this project was estimated at between $800,000 and $1 million. The money for this project was donated by the father of the late Captain Robert Crown, USNR, President of the Navy League of the United States from 1961 to 1963. Construction was started in January 1973 and the new Sailing Center was completed by June 1974.[137]

OPERATION DEEPFREEZE

Throughout the period under study, the Naval Facilities Engineering Command was deeply involved in providing support to scientists doing research in Antarctica under the sponsorship of the National Science Foundation.[138]

The Command's involvement in Antarctic support predated 1965 by eleven years. In 1954, the Department of Defense agreed to furnish logictic support for the Antarctic research planned for the International Geophysical Year, which was to begin on 1 July 1957. The Navy was designated to carry out this mission. In September 1954, Navy Task Force 43 set out for Antarctica in order to begin building the necessary research and support facilities.

The major task of the scientific support force was the establishment of bases. The construction job was given to the

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[137]"Naval Academy: Modernization Master Plan Status," p. 3 of 3.

[138]"Memorandum of Agreement, NSFCASS," from Mr. L. Jones, NAVFAC Construction, Code 053B.

Naval Construction Force. In February 1955, Mobile Construction Battalion (Special), the forerunner of Antarctic Support Activities, was formed at Davisville, Rhode Island. With the technical assistance of the Naval Facilities Engineering Command, plans were made for construction and maintenance of the Antarctic stations.

The first deployment to Antarctica, known as Deep Freeze I (1955) called for the establishment of two stations to be located at Kainan Bay (Little America V) and at McMurdo Island. Personnel of Mobile Construction Battalion (Special) wintered over at these two stations and prepared for the establishment of the Byrd and Pole stations during Deep Freeze II (1956-1957).[139]

By the start of the International Geophysical Year (IGY) in 1957, the Command had the necessary facilities ready. The program had progressed to the point where the function of Mobile Construction Battalion (Special), had become that of station maintenance. All major construction was the responsibility of an assigned regular Mobile Construction Battalion. In subsequent years, Deep Freeze III and IV were primarily re-supply missions, as all facilities had already been established. Deep Freeze IV was originally to mark the termination of the Antarctic IGY Program and the closing of the bases. However, because further scientific research was desired, it was decided to continue the program indefinitely.[140]

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[139] Antarctic Support Activities: Command History (1967), p. 2.

[140] Ibid., p. 3.

Although continuing, the program was reduced in size. In 1959 Naval Support Force Units, Antarctica was disestablished and Antarctic Support Activities, based at McMurdo Sound, was established in its place. During this same year Antarctic Support Activities, Detachment ALFA was formed at Davisville, Rhode Island.

The mission of Antarctic Support Activities was to operate and maintain station facilities and provide logistic support in order to assist in the accomplishment of United States scientific programs in Antarctica. Antarctic Support Activities was directly responsibile for the maintenance of bases and associated facilities, procurement of supplies, air traffic control, and communications. Antarctic Support Activities was originally homeported at Davisville, Rhode Island, and deployed annually to Antarctica in September. It returned in early March, leaving Detachment ALFA to maintain the stations during the austral winter.[141]

The Deep Freeze operations were henceforth named to coincide with the fiscal year. Operation Deep Freeze 60 saw much renovation of old facilities and construction of several new ones. Deep Freeze 61 saw the introduction of C-130 aircraft for re-supply. During Deep Freeze 61, construction was started at McMurdo for the proposed nuclear power plant. Deep Freeze 62 saw the completion of the nuclear power plant and on 10 July 1962 it delivered its first power to the base. During Deep Freeze 63, an air navigational

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[141] Antarctic Support Activities, p. 1.

aid unit was formed (March 1962). Originally a detachment of Naval Support Force, Antarctica, it was assigned to Antarctic Support Activities on 15 July 1963 and homeported at the Naval Station, Mayport, Florida. During Deep Freeze 64, the first mid-winter flight to Antarctica was made in order to evacuate an injured man. Until this time, all personnel wintering-over had been isolated from the rest of the world for seven months.[142]

During the summer operating season of Deep Freeze 65, Naval Mobile Construction Battalion 6 constructed a new station above the Antarctic Circle on the Palmer Peninsula. Personnel from Antarctic Support Activities subsequently manned the station. Naval Mobile Construction Battalion 6 also built the first highway in Antarctica that year. Its construction greatly aided the unloading of cargo ships resupplying the Antarctic facilities. On 25 February 1965, Hallett Station (built in 1957) was closed as a winter-over station, but was retained as a summer station. Also during Deep Freeze 65, work on a new, modern medical dispensary was started, and a new generator and a water distillation plant was constructed. The latter was to relieve the water scarcity problem that had heretofore plagued McMurdo Station. A new docking facility, Elliott Quay, was also built at McMurdo to improve the efficiency of ship unloading operations. This facility permitted the unloading of ships directly onto wheeled vehicles, rather than onto sleds for

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[142] Antarctica Support Activities, p. 5.

a long trip over the bay ice then a transfer to wheeled vehicles for final movement to the warehouses.[143]

The summer operating season of Deep Freeze 66 saw the deactivation of Eights Station (established 1963) on 15 November 1965. On 13 December 1965, an initial flight to the high polar plateau was made to begin construction of the new Plateau Station. During the winter, this station recorded the lowest temperature ever at an American Station: -121.4 F.

During the Antarctic winter of that year it was necessary to make two more emergency air evacuations, first from McMurdo Station and then from Byrd Station.[144]

Deep Freeze 67 saw a new Seabee unit join the Antarctic Support Force (Antarctic Support Activities' new designation). Prior to this year regular Mobile Construction Battalions had been assigned on a rotating basis to carry out Antarctic construction for the Command. It was decided that a unit specialized solely for Antarctic construction would be more effective in the unusual and hostile environmental conditions that exist at the South Pole. Thus, on 1 June 1966, a special Seabee unit, Naval Construction Battalion Unit 201, was established to specialize in construction work in Antarctica. This unit deployed to Antarctica in October of that year as part of Deep Freeze 67.[145] During the summer

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[143] Antarctic Support Activities, p. 5.

[144] Ibid.

[145] "New Seabee Unit for Construction in Antarctica," Civil Engineer Biweekly Report, No. 18-66 (16 Aug 1966).

season of Deep Freeze 67, Naval Construction Battalion Unit 201 worked on a new personnel housing building (the biggest building in Antarctica), and completed a new dispensary, the largest and most complete opened to date. Work went forward on numerous other projects and included the laying of fuel and sewer lines, the starting of the water distillation system at McMurdo, and the completion of two warehouses. During Deep Freeze 68, work continued on projects not completed the previous year. One project, the installation of protective facing on Elliott Quay, had to be deferred because of the late arrival of the materials.[146]

During Deep Freeze 69, a considerable amount of construction was accomplished by Naval Construction Battalion Unit 201, then in its third consecutive year in the Antarctic. Among the projects completed were the personnel housing building subsistence area at McMurdo Station and a new frozen foods warehouse. Construction also began on a new administration-operations building and on scientists quarters. Completion of these projects was scheduled for Deep Freeze 70. The major problem during Deep Freeze 69 was one that had plagued Deep Freeze operations for some years previously: the lack of sufficient construction time for the projects planned. Adverse weather conditions and material status worked to reduce the already limited construction time available, so

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[146] Antarctic Journal (Jul- Aug 1969), p. 147.

that projects had to be continued over to following Deep Freeze deployments.[147]

During Deep Freeze 70, emphasis continued on McMurdo Station reconstruction. Several projects continued from the previous season were completed and new construction was undertaken. This new construction included an administration building for USARP, two fuel storage tanks with a combined capacity of 2.5 million gallons and an unheated warehouse. In addition a 180 man mobile quarters complex was to be built at William's Field. Once again poor weather conditions hampered construction.[148]

During Deep Freeze 71, Naval Construction Battalion Unit 201 began construction on a new South Pole Station which had been designed by the Command. The third floor of the administration building at McMurdo was completed and a third water distillation plant was installed. Several other minor projects were also completed. After five straight years of Deep Freeze deployments, Naval Construction Battalion Unit 201 was disestablished after completing the Deep Freeze 71 deployment.

Naval Construction Battalion Unit 201 was replaced on Deep Freeze 72 by Naval Mobile Construction Battalion 71. Major projects undertaken during Deep Freeze 72 included further work on the new

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[147] U.S. Naval Construction Battalion Unit 201--Deployment Completion Report (8 May 1969), p. 5.

[148] Ibid.

South Pole Station, a new station at Siple and several large projects at McMurdo Station to enhance the livability of the station. Extremes of weather continued to hinder construction.[149]

During Deep Freeze 73, the Command continued construction on the previous year's projects; work went forward on the Siple Station and on the South Pole Station. On 23 January 1973, the Siple Station was formally turned over to the winter-over station leader.[150]

Deep Freeze 74 was the final year that Naval Construction Force personnel participated at unit strength in Deep Freeze construction. Construction continued on the new South Pole Station and on 7 February 1974, the battalion completed and turned the station over to the Naval Support Force Antarctica and the National Science Foundation.[151]

Beginning in Deep Freeze 75, all construction work for the Naval Support Activity and the National Science Foundation was done by contract. Only a few Naval Construction Force personnel were present and they were assigned to public works activities.

Despite the fact that Naval Construction Force units were phased out, the Naval Facilities Engineering Command still remained

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[149] Naval Mobile Construction Battalion 71--Deployment Completion Report (21 Mar 1972), pp. iii and 1-5.

[150] Naval Mobile Construction Battalion 71--Deployment Completion Report (27 Mar 1973), pp. 3-5. On 19 Sep 1972, the nuclear power plant unit at McMurdo was deactivated. See Chapter 8 for further information.

[151] Naval Mobile Construction Battalion 71--Deployment Completion Report (9 Apr 1974), p. (5).

very active in Deep Freeze support during 1975. The almost total shutdown of the Construction Battalion Center at Davisville, Rhode Island in 1975 compelled the transfer of the Command's Deep Freeze support activities to the Construction Battalion Center at Port Hueneme, California. The experimental air squadron assigned to the Deep Freeze Force was assigned to the nearby Point Mugu naval facility. By May 1975, the transfer of these support activities had been effected.[152]

HYPERVELOCITY WIND TUNNEL

The Hypervelocity Wind Tunnel was an extremely impressive research facility that the Naval Facilities Engineering Command built for the Naval Ordnance Laboratory during the late 1960s and early 1970s.

The project consisted of an 18,200 square foot steel frame, masonry and reinforced concrete building containing highly sophisticated wind tunnel test equipment. Hypervelocity ordnance vehicles under development by the Navy required shapes, structures, and material specifications designed to meet conditions of exit and reentry in their flight. The hypervelocity wind tunnel was the only facility of its kind in the world capable of furnishing experimental information on aerothermodynamic behavior and

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[152]Even while the Davisville Center was the primary Deep Freeze Support point, the Port Hueneme Center had been active in helping to provide logistic support to Deep Freeze.

aerodynamic stability of vehicles flying at speeds from mach 10 to mach 20 with laminar flow.[153]

The Aero and Hydroballistics Directorate at the Naval Ordnance Laboratory did the conceptual planning for the new Hypervelocity Wind Tunnel. Scientists from the laboratory prepared documentation to prove to Congress that the tunnel could be built and later they provided specifications for construction as well as technical assistance during actual construction.

The Hypervelocity Wind Tunnel was authorized and funded in the fiscal year 1967 Military Construction Program. The basic construction contract for the 18,200 square foot building was completed in November 1971 at a cost of $1.5 million. In addition, there were thirteen military construction related procurement contracts involving both military construction and other procurement Navy funds.

The Command's Chesapeake Division was the construction agent for the building and the major system components, while system test, instrumentation, and calibration were the responsibility of the Aero and Hydraballistic Directorate.[154]

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[153]"FY67 MCON Project X-161 Hypervelocity Wind Tunnel, NOL, White Oak, Md.,"Draft Point Paper (25 Aug 1972), NAVFAC Construction, Code 051PJ.

[154]Ibid.

## NAVAL TRAINING CENTER, ORLANDO

In the early 1960s, the Navy had only two recruit training centers, one at San Diego, California and the other at Great Lakes, Illinois. Although these two installations were equipped with many modern facilities and new constructions, many temporary Second World War structures no longer suitable in the 1970s were still in use.

There simply were not enough permanent facilities at these two bases to meet the needs of the Navy's training program or allow for the expansion that would result in case of full mobilization. During the period 1963-1965 a new factor was added which further aggravated the situation. An outbreak of spinal meningitis forced the temporary suspension of recruit training at the Naval Training Center, San Diego. As a result, all recruits were now sent to the Naval Training Center, Great Lakes. Unfortunately this aggravated the problems which already existed there.[155]

Although the Naval Training Center, San Diego was reopened after the meningitis danger passed, the Navy decided that it needed a third naval training center. This decision was made for a number of reasons. The camp facilities at Great Lakes and San Diego were heavily overloaded. The danger of another epidemic like the meningitis epidemic at San Diego made a third camp desirable. (Thus, if one camp had to be closed, the other two could, on an

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[155]Goodwin interview.

emergency basis, provide sufficient recruit training.) There was also a desire to concentrate at one location for maximum efficiency such facilities as the Wave Recruit Camp, the Advanced Underwater Weapons School, the Nuclear Power School and the Service School.[156] Geography also played a part in the decision; for travel reasons a camp was deemed necessary in the southeastern part of the country.

The Naval Facilities Engineering Command was given the task of choosing a site for the new center and for designing and building it. The Command did this in conjunction with the Bureau of Naval Personnel which was responsible for the training of Navy personnel. The first step was to find the most suitable site. The Command's engineers and planners, together with representatives of the Bureau of Naval Personnel, visited all possible locations on the East Coast. After a thorough study, the Air Force Base at Orlando, Florida was selected, because it was scheduled to be closed and was considered best suited to fill the Navy's needs at maximum economy. Since the government already owned it, no expensive land purchase would be necessary. Orlando possessed many other advantages: year-round temperate climate, proximity to water, modern local transportaion and a very receptive community. A base at Orlando would also relieve the overcrowded base at Key West, Florida.[157]

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[156]"Black Book: Naval Training Center; Orlando, Florida Status," (6 Mar 1970) R.S. Goodwin, NAVFAC Construction, Code 052PJ, pp. 1-2.

[157]Ibid.

The Deputy Secretary of Defense notified the pertinent congressional committees on 6 December 1966 of the naval training center site selection at Orlando. The Under Secretary of the Navy publicly announced the site choice that same day.[158]

In the fiscal year 1967 Military Construction Program, $13.6 million was programmed for the first increment of the first male recruit camp at Orlando. Included in this sum was money for the first increment of the Advanced Underwater Warfare instruction building. Preparations of plans and specifications was begun in March 1966 and the projects were completed in October 1969.[159]

In fiscal year 1968, $13.6 million was programmed for the second increment of the first male recruit camp, and the second increment of the Advanced Underwater Warfare instruction building (minor construction for an interim dispensary was also included). Planning was begun in January 1967 and construction was completed in October and November 1969.[160]

For fiscal years 1969 and 1970, $5.3 million and $12.9 million were scheduled for the third increment of the first male recruit camp (FY 1969), the first increment of the second male recruit camp (FY 1969), and for the second increment of the second male camp (FY 1970). As it happened, these projects were indefinitely deferred

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[158]"Black Book."

[159]"NAVFAC Code 05 Execution Status Report as of 31 Mar 1975."

[160]Ibid.

because of the presidential construction freeze which was in effect during fiscal years 1969 and 1970.[161] The projects were finally completed on 30 March 1975.[162]

In fiscal year 1971, $17.7 million was programmed for the first increment of the service schools. Plans and specifications began in March 1970 and construction was completed in October 1972. An additional $2.4 million was funded for utilities; the work was completed by June 1972.[163]

For fiscal years 1972 through 1975, $48.9 million was programmed by the Bureau of Naval Personnel. These funds were programmed for additional items for the male recruit camps, the service schools, the Wave recruit camp and the common support facilities. A specific fiscal year 1973 line item was a $3.7 million instruction building. This project was awarded in July 1973 and completed by April 1975.[164] One special program under the 1975 Military Construction Program was the nuclear power training building, built at a cost of $4.6 million. The contract was awarded in April 1975.

As yet unprogrammed military construction items consisted of $15.9 million for additional items for the recruit camps, service schools and the common support facilities, and $16.2 million for the replacement of the 250 bed naval hospital, along with its enlisted

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[161]"Black Book," p. 2.

[162]"Execution Status Report."

[163]Ibid.

[164]Ibid.

barracks and recreation building. This hospital was to be a permanent regional hospital and would serve all the armed forces personnel in the area. The total cost of the entire program was to be approximately $145.7 million. Of this $129.4 million was for the naval training center and $16.2 million for the naval hospital.[165]

PORT CHICAGO PURCHASE

During fiscal years 1968 and 1969, the Construction Program participated in a major Navy property acquisition, the purchase of the town of Port Chicago, California. Port Chicago was located near the three ammunition loading piers of the Naval Weapons Station, Concord, California. The Vietnamese War brought about a dramatic increase in this installation's activity as it was the main ammunition shipping point for Southeast Asian operations. At any given moment an average of nine million lbs. of high explosives could be found on piers #2 and #3 during this period and an average of six million lbs. on pier #4. Department of Defense requirements called for a safety zone of two miles around ammunition loading areas to minimize damage from possible accidental explosions. On the basis of this requirement and cognizant of the increased risk generated by the extraordinary activity on the piers during this period, the Navy decided to purchase the town of Port Chicago. The Command was designated as the Navy's agent in this transaction. The sum of

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[165]"Execution Status Report."

$19.8 million was authorized during fiscal year 1968 for the purchase. Some 3,051 acres were involved. The entire purchase took approximately two years to negotiate.[166]

NAVAL WAR COLLEGE REDEVELOPMENT PROGRAM

The Naval War College Redevelopment Program provided for a progressive four stage expansion of campus facilities through new construction and through rehabilitation of existing buildings at the Naval War College. The college was expanded to the northeast from the previously existing Luce-Pringle-Mahan complex, which was retained in the new configuration. After the redevelopment, all buildings, both old and new, were interconnected by covered passageways. Three of the new buildings contained two lower levels, each with ramped parking areas providing spaces for over 500 cars. The program conformed to the Newport Naval Base Master Plan which developed a long-range physical land-use site design plan for the overall needs of the base.

The goal of the redevelopment program was an annual total of 700 Naval War College resident students by 1980. Of this number, 560 were to be U.S. Navy Officers, 520 unrestricted line officers and 40 restricted line and staff corps officers.

The number of students was to be increased by a given number each fiscal year till projected totals were arrived at. These

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[166]Interview with Mr. C. J. Stevens, NAVFAC Construction, Code 051PH, 21 May 1975.

increases were accompanied by proportional increases in officer, enlisted, and civilian faculty and staff.[167]

CHART 10-10 PROJECTED TOTAL NUMBER OF STUDENTS BY SCHOOL

| | |
|---|---|
| School of Naval Warfare | 160 Navy |
| | 60 Other Services and Agencies |
| School of Naval Command and Staff | 400 Navy<br>50 Other Services |
| Naval Command Course | 30 Foreign Navy |

The military construction program was phased to accommodate the projected personnel increases and permit normal operation of the Naval War College while construction and rehabilitation was taking place.

A unique item in the program was the Professional Educational Center, Raymond A. Spruance Hall, an 800 seat core auditorium expandable up to 1,120 for combined attendance events. For concurrent use, the large hall divided into two separate, smaller lecture halls whose sizes were related to the ultimate enrollments of the School of Warfare and the School of Naval Command and Staff. Expansion to a capacity of 1,120 was provided for by convertibility features built into several seminar rooms at the rear of the large

[167] Goodwin interview.

hall. This building also provided faculty office space, and study room capacity for fifty students.[168]

The entire program was based upon long-range planning guidance and was subject to the normal constraints regarding availability of funds and planned officer resources throughout the period of construction. The Redevelopment Program was planned as a four step program. The first step was the construction of Raymond A. Spruance Hall. Construction of this building began in 1970 and was completed in December 1972 at a cost of $2.1 million.[169]

The second major construction project was Richard L. Conally Hall. This building was built to provide command, faculty, and administrative spaces plus study space for 125 students. Construction began in September 1971 and was completed in late 1973 at a cost of $4.4 million.[170]

The third construction stage was the building of the Henry K. Hewitt Hall. This structure contained study space for 325 students plus supporting faculty. This building was funded under the fiscal year 1973 program. Construction began in November 1973 and was to be completed in early 1976 at a cost of $8.5 million.[171]

The fourth stage consisted of the rehabilitation of Luce, Pringle and Mahan Halls to provide functionally adequate space for

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[168] Goodwin interview.

[169] Ibid.

[170] Ibid.

[171] Ibid.

an expanded, modern library and support functions. The project was begun in 1974 and was to be completed in 1976. These buildings represented the original Naval War College, as it was before redevelopment began.

The last Naval War College project was undertaken in fiscal year 1975. This project consisted of some alteration to Sims Hall, a pre-existing building at the north end of the newly constructed buildings. The sum of $971,000 was authorized and bidding was open on 22 May 1975. The estimated completion date for this work was May 1976. This last bit of reconstruction wound up the War College Redevelopment Program.[172]

RED HAT

During 1969 and 1970 public pressure increased in Japan for the removal of U.S. chemical warfare agents stored on Okinawa. A leak in one of the gas-casings brought this pressure to an intense pitch and even threatened the continued existence of the current Japanese government, which had always been friendly to the interests of the United States.[173]

Throughout this period of increasing pressure the U.S. Army investigated possible new storage sites throughout the Pacific, Alaska, and the northwest United States. Johnston Island in the Pacific was finally selected as the new site.

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[172] Goodwin interview.

[173] Memo from FAC-053A of 28 May 1971; Jones interview.

Because of the unremitting pressure on the Japanese government, in December 1970 a decision was made at the highest levels, that the new storage facility must be completed to meet a twelve month relocation schedule. Designing and building a facility, costing an estimated $6 million, on a twelve month execution schedule was a difficult enough assignment. To make matters worse, the remoteness of the location made it necessary to ship in all labor, equipment and materials from Hawaii and the mainland United States.[174]

Despite these formidable obstacles, the Army asked the Command to undertake this project and, further, to accelerate the construction completion date to 15 May 1971 in response to a high level request. The key to meeting this date was the immediate availability of prefabricated structure to meet the requirements.

Unfortunately, the Army had not yet made provisions or set requirements for the construction of the needed facilities. The Command took over, got a set of requirements for the project, and then set about locating usable prefabricated structures. It was determined that a large supply of such structures was available in the Prepositioned War Reserve Stocks. The Command then convinced the Army to modify their requirements to the extent that these structures could be used. Such modifications did not adversely affect the life, safety or usability of the finished structures. Plans were completed on this basis, construction proposals were received and a contract award was made in less than

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[174]Memo from FAC-053A of 28 May 1971; Jones interview.

one month after the start of the project. Cost, including the Prepositioned War Reserve Stocks buildings, was substantially less than would have been the case with the original, unmodified Army requirement criteria.[175]

## NAVAL COMMUNICATION STATION, DIEGO GARCIA

The Navy's communications facility on the atoll of Diego Garcia was a major Command project during the 1970s. Before the Diego Garcia facility was established, the Indian Ocean had been a blacked-out area in the Navy's worldwide communications network. Construction of the Diego Garcia facility was undertaken to remedy this situation. The facility was built primarily by personnel of the Naval Construction Force under a bilateral agreement between the United Kingdon and the United States. What of the atoll itself?

Diego Garcia is 12,000 miles from the nearest United States port. Even within the geography of the Indian Ocean it is isolated. Before construction began, the nearest airfield was located at the British base at Gan, 400 miles to the north. The nearest commercial port is Colombo, 960 nautical miles distant.[176] The atoll is part of the British Indian Ocean Territory (BIOT), formed in 1965 from territory formally belonging to Mauritius and the

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[175]Memo from FAC-053A of 28 May 1971; Jones interview.

[176]"Project Reindeer Station, Diego Garcia: Deployment Information" (undated briefing), from Mr. W. J. Vacca, NAVFAC Construction, Code 051PJ, pp. 1-2.

Seychelles Islands. The atoll is one of fifty-two which make up the Chagos Archipelago which spreads over an area of 10,000 square miles. The Chagos Archipelago is located in the heart of the Indian Ocean, south of India and between the African continent and Indonesia.

Diego Garcia is a narrow coral atoll having a land area of about eleven square miles, which nearly encloses a lagoon. It is shaped roughly like a "V", which stretches thirty-seven miles from tip to tip, with an opening to the north-northwest. Shallow reefs surround the atoll on the ocean side as well as within the lagoon. Most of the aggregate used in the construction effort was blasted from the outer reefs, then crushed to required size.

Diego Garcia was discovered approximately 400 years ago by the Portuguese. It subsequently fell under French control and in 1814 it passed to the British. In 1974 it was part of the British Indian Ocean Territory. In the past, the atoll's major industry was copra. In addition, there was a phosphate mine and the atoll further served as a coaling station.

In December 1966, the United Kingdom and the United States signed a bilateral agreement constituted by the Exchange of Notes dated 30 December 1966 (BIOT Agreement 1966), which made the islands of the British Indian Ocean Territory available for the defense purposes of both governments as need arose. On 24 October 1972 a supplementary agreement was signed by the two governments concerning the construction of a limited United States Naval Communications

Facility on Diego Garcia (Diego Garcia Agreement 1972). The purpose of this facility was to provide a link in United States defense communications and to furnish improved communications support in the Indian Ocean for ships and aircraft owned or operated by or in behalf of either government. Following Department of Defense approval of the plan, the first two increments of the project were submitted to Congress, and were approved and subsequently funded in the fiscal year 1971 and 1972 Military Construction Appropriation Acts. Construction was to be accomplished by the United States, utilizing units of the Naval Construction Force.

The base on Diego Garcia was initially planned as an austere communications station with all necessary supporting facilities including an airstrip. The project was originally intended to be completed within three years, however, this deadline was later extended a year to July 1975. Pursuant to the Diego Garcia agreement of 1972, supplementary arrangements were also made between the Royal Navy and the United States Navy for the joint operation of the communications facility. Consequently, both the British and American flags would fly over the facility and the United Kingdom would assist in manning it.[177]

The actual construction presented several problems to those who would do the building. One of the most critical problems on

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[177]"Deployment Information: Diego Garcia," p. 3.

Diego Garcia was that of obtaining good fill material. Vast amounts of fill were needed for the foundations of all horizontal and vertical structures. In addition, good material was required for aggregate for the concrete work done on the atoll. Due to the limited amount of developable land on the atoll, future expansion would require that marginal lands be filled and made buildable. These marginal lands included marshy lowlands, borrow pits and shallow portions of the lagoon.[178]

There were three sources of fill material on the atoll: (1) borrow excavation, (2) the coral shelf that surrounded the atoll, and (3) dredged material. The first two sources were the least desirable because borrow pits made additional land areas unusable and mining of the coral shelf was both costly and difficult. Dredging offered the best method of obtaining fill material and aggregate in terms of quantity and quality. It was recommended that whenever feasible all the dredged material be deposited ashore. This amount should be sufficient to provide fill for all projects planned on Diego Garcia. Where feasible the dredged material was stockpiled and/or put in areas of future potential use.

Certain constraints also limited the nature and location of construction on the atoll. Not only was the amount of developable

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[178] Master Plan for U.S. Naval Support Facility, Diego Garcia (Feb 1975), p. B-3.

land on Diego Garcia limited, but much of the better land was not available due to the presence of various clearance requirements related either to safety or to operational factors. One of these operational factors concerned the communications installation itself. In order to assure minimum interference between high frequency transmitter and receiver, there had to be a separation distance of fifteen miles between the two. The receiver station was to be located five miles from the airfield, five miles from the primary power plant, one mile from the cantonment area and three miles from the light industrial areas.[179]

Air safety also put constraints on construction. The Air Installations Compatible Use Zone (AICUZ) was intended to define an area where land uses which were incompatible with air operations would be excluded. The Air Installations Compatible Use Zone was derived from two elements, noise and crash potential. Noise contours and crash potential areas were deliniated for Diego Garcia. The Air Installations Compatible Use Zone could contain such compatible uses as outdoor recreation, industrial facilities, warehousing and patroleum storage. Airfield safety requirements made it necessary to restrict all construction within 750 feet of the runway center line. Beyond that line facilities could be constructed which did not penetrate a 7:1 slope. It is also necessary that zones 3,000 feet beyond the end of the runway be free from obstruction.

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[179] Master Plan: Diego Garcia, p. B-3.

Another constraint on building was the 600 foot clearance zone that had to be maintained around the Radar Wind sending building, which was located approximately 1,500 feet west of the Air Operations building.

Water was also a limiting factor. Due to the critical water supply situation, several areas were designated as "water zones." No construction was allowed in these areas in order to insure an acequate supply of well-water to support the needs of the personnel on the island.

There was also a necessity for the safe storage of explosives. Since no inhabited structures could be built within the Explosives Safety Quantity Distance (ESQD) arcs generated by stored explosives, the safety zones imposed a rather extensive limitation on developable land.[180]

The final limitation on development concerned the boundaries of the areas alloted to each of the two contracting powers. In accordance with the agreement between the United States and British governments, the United States could use the west side of the atoll up to latitude $7^{o}24'30"$ S on the east side of the atoll.[181]

On 23 January 1971, a nine man reconnaissance party from Naval Mobile Construction Battalion 40 landed on Diego Garcia to confirm planning information and to initiate a preliminary survey of the

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[180] Master Plan: Diego Garcia, p. B-5.

[181] Ibid.

beach landing areas. Subsequently, during early March 1971, a fifty man landing party arrived at Diego Garcia aboard the USS Vernon County (LST 1161). This party comprised personnel of Naval Mobile Construction Battalion 40, Amphibious Construction Battalion 2, Anphibious Forces Pacific Underwater Demolition Team, Construction Battalions Atlantic, and Air Transportable Communications Unit 4. Men from these units marked underwater obstructions, installed temporary navigational aids and cleared beach areas in preparation for an over the beach landing of additional personnel.

On 20 March 1971, an advance party of 160 men arrived and during the following month the main body of Naval Mobile Construction Battalion 40 landed. The ballation's main assignment was the construction of a temporary Seabee camp, construction of water and electrical distribution systems, completion of a camp dining hall, laundry, refrigeration and material storage facilities, and construction of a temporary industrial site and a 3,500 foot interim airstrip. Prior to the completion of the airstrip on 15 July 1971, all personnel, equipment and supplies had to be landed on the beach by LST and Mike boat.

In October and November 1971, Detachment "Chagos" of Naval Mobile Construction Battalion 71 and the whole of Naval Mobile Construction Battalion 1 arrived. Their arrival marked the beginning of large scale military construction on Diego Garcia. Naval Mobile Construction Battalion 1 devoted its major effort to erecting the receiver and transmitter buildings. Other projects

undertaken included the placing of the base course for the permanent runway, taxiway and parking apron, operation of a precast yard and block plant, and construction of the 5,000 foot POL lagoon causeway. Detachment "Chagos'" construction efforts were located at the permanent industrial site and consisted of four permanent structures, the largest of which was the cold storage and general warehouse. During this period civil service personnel from the Naval Electronics System Command were also deployed to Diego Garcia to provide electronic equipment installation support in conjunction with the construction of the transmitter and receiver buildings.[182]

In July 1972, Naval Mobile Construction Battalion 62 relieved Naval Mobile Construction Battalion 1. The men of the new battalion concentrated on the construction of the transmitter and receiver buildings. They also paved the airfield and continued work at both the cantonment and the industrial sites. On 25 December 1972, the first Air Force C-141 jet transport landed on 6,000 feet of completed permanent runway (with the Bob Hope Christmas Show Troupe). The concrete work on the full 8,000 foot permanent runway with adjoining taxiway and parking apron was completed by March 1973. Following completion of the runway, a weekly C-141 Military Airlift Command flight was initiated between Diego Garcia and Utapao, Thailand.

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[182]"Deployment Information: Diego Garcia," pp. 3-9.

The third Detachment "Chagos," composed of 180 men from Naval Mobile Construction Battalion 133, arrived in November 1972. It continued work on the air operations and radar wind buildings, the sewage lagoon, and bachelor officer and enlisted quarters.

During December 1972, personnel of the Naval Communication Station Pre-establishment Detachment began to arrive. Their task was to prepare for the acceptance of equipment and facilities as they were turned over for operations and maintenance. In February 1973, the first group of Royal Navy personnel arrived to join the Naval Communication Station Pre-establishment Detachment. This group officially relieved Air Transportable Communications Unit 4 of its duty of providing off-island communications support to all units on the atoll. Finally on 20 March 1973, exactly two years after construction began, the Naval Communications Station, Diego Garcia, was officially establishment.

During March, Naval Mobile Construction Battalion 74 relieved Naval Mobile Construction Battalion 62 and subsequently continued work on various projects, giving special attention to runway lighting and the work at both the industrial and cantonment sites. During June 1973, there was another unit change, when Detachment "Chagos" of Naval Mobile Construction Battalion 10 relieved Detachment "Chagos" of Naval Mobile Construction Battalion 133.[183]

The second construction increment slated for the Naval Communication Station, Diego Garcia was the provision of a ship

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[183]"Deployment Information: Diego Garcia," pp. 3-4.

channel and turning basin in the lagoon. This construction was awarded as an international contract to a construction firm from Taiwan. Construction began in August 1973 and would take two years to complete.

Most of the station's facilities were built in the cantonment area, located at the northern most tip of the atoll. The station's personnel were quartered and supported here. This area was designed as a walking/bicycling community, hence auto and truck traffic was strictly limited. Community support facilities included a gym, bowling alley, chapel, medical facility, Navy exchange, swimming pool, All Hands Club, and playing fields and courts. Additional planned facilities included an Armed Forces radio and television station, chapel addition, hobby shop, special services issue office, theater, library and education center. A Chief Petty Officers Club, Officers Club, snack bar and recreation area were also eventually to be built.[184]

The administration building was also located in the cantonment area. It was located thus because this location was readily accessible to personnel being supported and to the administrative personnel who worked there. An addition to this building was planned. A fire station was also sited in the cantonment area. Generally a location central to the developed area would have been preferred. However, since Diego Garcia was long and narrow and

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[184] Master Plan: Diego Garcia, p. C-3.

and since most of the facilities which were considered to be life safety hazards were concentrated in the Cantonment Area, a site there was deemed most suitable for a fire station.

The second major area of construction was the airfield and its supporting activities. It was located about midway down the length of the western side of the atoll. Revised requirements called for the extension of the original 8,000 foot runway to 12,000 feet. In order to avoid expansion into the ocean or lagoon, 3,000 feet were added to the southeast end and 1,000 feet to the northwest end of the runway. A 1,000 foot overrun was required at each end of the lengthened runway. An additional requirement called for an increase in the size of the parking aprons by 89,750 square yards so that taxiways and runway turnarounds might be built. The following new airport support facilities were also deemed necessary: an air transportation hangar, operations building expansion, airfield transit storage, an aircraft washrack and a crash fire station.

The public works area (formerly the industrial area) was located approximately five miles south of the airfield and its supporting facilities. Supply support for the atoll was centralized at this point. As the permanent facilities on the atoll began to take shape, certain geography related problems began to manifest themselves. All automotive and construction equipment on the atoll operated under very adverse environmental conditions. Experience showed maintenance demands to be extreme and vehicle downtime high. Accordingly, vehicular travel was limited as much as possible.

The land use plan incorporated this rationale through designation of the northwest tip of the island for the cantonment area and the establishment of a new supply support point near it. The location of warehouses in the public works area made it necessary to move 90 percent of all supplies a total of twenty miles (airfield to warehouse plus warehouse to cantonment area). This was a particularly bad practice for cold storage items.

The Navy's POL storage requirement was 480,000 barrels in support of both ship and aircraft needs. The Air Force required an additional 160,000 barrels of storage. The POL site was located between the warehouse area and the Seabee construction support area. The original construction plan had the POL tanks located on a fill area adjacent to the causeway. A new site was required for the following reasons: (1) the old site would require use of critical fill material needed for other planned facilities, (2) the need to expand airfield facilities into the area along the causeways, (3) and the preference of POL operators to locate the storage tanks at a less exposed site. A new site was selected north of the airfield. It had the advantage of being located near the causeway/fuel pier and airfield operations area. One disadvantage was that a borrow pit was being used on the site. It would have to be filled and the area regraded before construction of the fuel tanks could begin.

Additional public works shops and stores were to be provided through conversion of existing general warehousing and cold storage

facilities located in the public works area. The warehousing function was to be consolidated in the new supply support area.

The expansion of the existing power plant by two additional 1,200 kilowatt generators was proposed. In order to retain the necessary separation for noise, access and fire safety between the existing public works office and the power plant, the natural expansion direction was to the south. However, two fuel tanks had been built in this area. These tanks would have to be relocated prior to the construction of the power plant extensions.

Since the primary function at Diego Garcia was initially communications support, the communications facilities were the most completely developed. The locations of the receiver and transmitter areas were for all practical purposes fixed by the existence of permanent buildings and antennas. An addition to the receiver building (located in the cantonment area) was the only expansion of communications functions planned during 1975.[185]

Waterfront facilities were built in the cantonment area. By 1975 these temporary facilities were judged inadequate for both offloading and maintaining the boats which were the only means of moving cargo from ship to shore. Even if a pier were to be built, boats would still be required for movement of cargo. A permanent facility which would allow efficient offloading of the boats was a necessity. In order to maintain the boats properly, a complete

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[185] Master Plan: Diego Garcia, pp. C-8--C-9.

maintenance facility was required. The maintenance facility was to include previsions for removing boats from the water for overhaul and returning the boats to the water afterward.[186]

Additional modifications planned for the waterfront area included a small boat pool and a pier. The small boat pool was to be located at the causeway and would contain facilities for lifting boats out of the water, a boathouse, moorings for all small boats and a crane for loading and offloading cargo. The pier was to be T-shaped and would extend out into the lagoon from the end of the existing causeway.[187]

A fleet recreation area was considered necessary to accommodate the large number of fleet personnel who might be on shore at various times. All personnel support facilities in the cantonment area were designed for the support of the permanent party. They were not large enough to support additional transient fleet personnel. Because of this, a fleet recreation facility located away from the permanent cantonment recreation was to be provided. Other presently planned facilities include a hardstand for the vehicles of the Marine Amphibious Unit (to be located near the causeway), and short-term training facilities for Marine personnel.[188]

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[186] Master Plan: Diego Garcia, pp. C-8--C-9.

[187] Ibid., p. C-9

[188] Ibid.

By 1975 permanent electrical power generating facilities had been constructed on the atoll. These facilities included the main power plant, three standby power plants and a regulating vault. The main power plant located in the public works area, was composed of four 1,200 KW generators which generated power at 41,160 volts. It was proposed to add two additional 1,200 KW generators to this plant. The standby generators were located respectively at the transmitter station, the receiving station, and at "C" building. The regulating vault was located at the air operations building.

Two barge-mounted desalinization units furnished the atoll's water supply. The planned permanent facility, which was to be located within the main power plant building, included two 60,000 GPD capacity units designed to operate on heat recovered from the main power plant generating units. A subsequent study for alternate solutions for the water supply indicated that a groundwater source utilizing the electrodialysis method for water treatment was best suited for Diego Garcia.[189] Electrodialysis units were to be installed at the various centers of water demand. The plan to install the desalinization units in the power house was consequently discarded and the space set aside for them was used in subsequent expansion of power generating facilities.

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[189] Ltr from COMPACNAVFAC of 13 Jul 1973 (09F:mm serial 4603).

Sewage disposal on Diego Garcia was rather simple and straightforward. Sewage from the cantonment area was pumped to a large sewage lagoon which had an ocean outlet. Sewage from all other facilities was handled by small septic tanks with leaching fields. No expansion to any of these systems was expected.

As the Naval Communication Station, Diego Garcia was still a developing facility at the end of 1974, expecially as regards its total final mission, many changes and additions can be expected in construction planned for it in the future.

## VERY LOW FREQUENCY FACILITY, ANNAPOLIS

In the late 1960s the Navy decided to build a very low frequency communications facility at the Naval Radio Station, Annapolis, Maryland. This facility was to be used for communicating with submerged submarines at great distances. In 1969, a contract was awarded to build a complex of six 600 foot towers and one 1,200 foot tower. All of these were insulated and were supported by guy wires.[190] The total cost was $5 million. On 9 December 1971, before the contract was closed out, tests revealed that one insulator in the central 1,200 foot tower was cracked. This discovery led ultimately to an operation unique in the annals of construction. In order to replace the insulator it was necessary to place jacks under special lifting pads at the tower's

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[190]Interview with Dr. M. Yachnis, NAVFAC Engineering and Design, Code 04B, 28 May 1975.

base. While preparations were being made to do this during the winter of 1972, cracks were discovered in the weldings joining these pads to the tower. During the spring of 1972, ultrasonic magnetic particle testing revealed that the welds were made without the full penetration required by the contract specifications. Attempts were made to repair the faulty welds by rewelding but they failed.[191]

It was deemed crucial that the cracked insulator be replaced as soon as possible because of the dangerous stress it put on the other insulators and because the tower was no longer insulated and could not be used. To lessen the strain on the lifting pads a girdle, or mechanical fix, was placed around the base of the tower in May 1972. In June, the tower was jacked up and all the insulators were removed, as it had been deemed advisable to install new, stronger insulators that could better handle the 1,500 ton load of the tower. Unfortunately the problems with the towers were only beginning. During the remainder of 1972 and the first half of 1973, spot testing at different elevations on all seven towers revealed further gross deficiencies in the welds, especially those at the points where guy wires were attached. The situation was especially critical with regard to the 1,200 foot tower. Since this tower had no redundant parts, if even one guy wire lug broke loose because of defective welding, the tower would collapse.

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[191]Yachnis interview.

Such a collapse would have not only resulted in millions of dollars in property loss, but would have also endangered the lives of all personnel in the area. Under similar circumstances such tower collapses had already occurred so there was little doubt that the weakened tower system should be removed. The risk of collapse was simply too great.

Only two viable courses of action were left open to the Navy--repair the tower as it stood, or dismantle it and rebuild at a later date. The first course of action was hazardous and would require the most exacting calculations if the collapse of the tower were to be avoided while repairs were in progress. It called for a systematic detensioning on the tower's guy wires so that the welding on the defective guy-wire mountings could be redone. Since no part of the tower guy-wire system was redundant, if one wire was detensioned, then other wires also had to be detensioned to varying degrees to keep them from pulling the tower over. Such an operation required not only an incredibly complex series of exacting calculation, but also needed skilled welders willing to work at great heights. The second alternative, that of dismantling and rebuilding, was safer, but also was prohibitively expensive. Whichever course of action was chosen, the decision had to be made quickly as the coming winter's storms would put still greater strain on the already weakened structure. The Naval Facilities Engineering Command chose the first course of action after an analysis of the risks and expense involved in both showed it to be the least disadvantageous of the two.

Welders with the requisite skills were found and the detensioning calculations were made. During the remainder of the summer of 1973 the necessary repair work was undertaken. Welds were redone at elevations of 600, 900 and 1,200 feet.[192] These repairs were completed by 22 April 1974. In May 1974, new insulators were installed under the jacked-up tower and in July 1974, the antenna, now fully operational, went on the air.

This incredibly delicate operations was a resounding success, not a man was lost and the tower was saved. The cost of the repair operation ran about $1.5 million, but the Command hoped to recoup this loss through litigation with the contractor. The VLF, Annapolis story is a chronicle of both failure and success. Failure in the sense that the original construction was fatally flawed. Success in the sense that the Command was able to save the project by means of brilliant engineering and decisive remedial construction work.

## THE NEW NAVAL HOME

In the early 1970s it became apparent that the Naval Home as it then existed was no longer adequate to meet the demands being placed upon it.

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[192]"Sequence of events associated with the VLF Antenna (1,200 ft), Annapolis, Md" (undated chronology), p. 2; M. Yachnis, "Fifty-year Development of Naval Facilities Construction," Journal of the Construction Division, ASCE, Vol. 101, No. CO1, Proc. Paper 11175 (Mar 1975), pp. 15-27.

The function of the home was to "provide an honorable and comfortable home for old and disabled officers and men of the Navy and Marine Corps who may be entitled under law." This entitlement was based upon: (1) wartime service in the Navy, Marine Corps, or Coast Guard (while operating as part of the Navy), (2) an honorable discharge, (3) the inability to earn a living through manual labor, (4) the meeting of minimum physical and mental standards (not infirm or senile and no chronic medical problems).

Entitlement changes were under study that would extend this eligibility to (1) any regular enlisted man or woman of the Navy or Marine Corps awarded retired pay or Veterans Administration compensation for a combat incurred disability, (2) any regular enlisted man or woman of the Navy, Marine Corps, or Coast Guard (while operating as part of the Navy) who served during wartime, who was honorably discharged, and who was unable to support himself through manual labor.[193]

The increasing needs generated by growing numbers of elderly veterans and the anticipated needs that could result from the above changes made it apparent that the facility at Philadelphia, as it existed, no longer sufficed.

In 1971 planning for the rehabilitation of the Naval Home at Philadelphia was initiated. The results of this planning showed

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[193]Interview with Mr. L. C. Stepp, NAVFAC Construction, Code 052PE, 19 May 1975.

that the existing 250-300 resident Naval Home could not be economically modernized and expanded to meet future anticipated resident needs. The construction of a completely new installation was decided upon. The thirty-six acre site chosen for this new construction overlooked the Gulf of Mexico between Gulfport and Biloxi, Mississippi. This site was selected as the most favorable after careful consideration of many factors including climate, location, construction cost, and expansion capabilities.[194]

The main building of the new Navy Home was an eleven story residential complex designed by the firm of John L. Turner and Associates, Architects and Engineers of Jackson, Mississippi. This structure provided completely self-sufficient housing, recreational and medical facilities for the residents. When completed the home would have a completely staffed clinic with a sixty bed nursing annex, resident quarters, cafeteria and dining areas, administration offices, an exchange, a bank, a post office, a bowling alley and a library; all located in the same building.[195]

Five units of family housing for administrative personnel were to be built nearby the new home. These new structures, in addition to an already existing swimming pool, chapel and storage building rennovated by separate contract, complete the project. Initial operation and occupancy of the new home was anticipated for early summer of 1976.

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[194]Stepp interview.

[195]Ibid.

If Congress were to authorize additional funds, further resident benefits would be provided. These included a large greenhouse, a pavillion with rest rooms and vending facilities (located midway between the beach and the main building), laundry facilities, and a pedestrian bridge across adjacent Interstate Highway 90 to permit easy access to the beach.[196]

The project which provided for the necessary rehabilitation of the existing Philadelphia Naval Home and construction of the new Gulfport Naval Home was authorized and funded in the amounts of $991,000 in fiscal year 1972, $3.3 million in fiscal year 1973 and $9.4 million in fiscal year 1974.

On 30 April 1974, a $15.9 million contract was awarded by the Command to Dyson and Company and Dyson Construction Company (a joint venture) of Pensacola, Florida, for construction of the new Naval Home.[197]

STEAM PROPULSION SYSTEM TRAINING FACILITY

The 1,200 pounds-per-square inch steam propulsion plant made its appearance in the Navy during 1953, when the need was felt for a smaller, more efficient and lighter machinery plant to replace the then standard 600 pounds-per-square inch steam propulsion plant.

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[196]Stepp interview.

[197]Ibid.; Memo to the Asst Secretary of Defense (I&L) of 7 Mar 1974, subj: Fiscal year 1972, 1973, 1974 MILCON project for Naval Home.

One hundred and forty-four ships, containing six hundred and fifty-eight boilers, used high pressure propulsion systems by 1970. Among these ships were the aircraft carriers USS Saratoga, Ranger, Independence, Kitty Hawk, Constellation, America, and John F. Kennedy. The high pressure systems were also used by the newer escort ships, such as the USS Bagley and Elmer Montgomery and the guided missile destroyers, USS Waddell and Cochrane. Although the installation of the 1,200 PSI steam propulsion plant was a step forward, the increased tempo of operations and the rapid development of a new system generated problems.[198] As ships began to age, manpower and experience levels fell behind operating requirements, and material readiness declined. Corrective programs were initiated, but none was successfully implemented.

On 1 October 1971, there was a change. The Chief of Naval Operations directed that immediate steps be taken on an urgent basis to effect improvement in the material readiness and reliability of the 1,200 PSI steam propulsion plant. With this order, the 1,200 PSI Steam Propulsion Plant Improvement Program was established. This program was concerned with the entire plant and provided the centralized management and overall coordination needed to eliminate personnel, design, material, training and logistic deficiencies.[199]

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[198]"Management Plan for 1,200 PSI Hot Plant Construction Great Lakes, NTC," OP-04P/mab, Ser 04P/15 (31 May 1973), pp. 1-2; Goodwin interview.

[199]"Management Plan for 1,200 PSI Hot Plant."

One of the projects of the 1,200 PSI Steam Propulsion Plant Improvement Program was the construction of a 1,200 PSI Hot Plant at Great Lakes Naval Training Center. At this time there were no naval facilities to provide basic training in high pressure propulsion systems to non-rated boilermen, engineers, and machinist mates before they were assigned to a high pressure propulsion system ship. This lack of training was directly related to the excessive number of propulsion system casualties that ensued during this period.[200]

It was decided to build this facility at Great Lakes Naval Training Center, because this installation had the only Navy school teaching basic steam theory to non-rated trainees. This instruction was given on a 600 PSI steam propulsion system. The new 1,200 PSI Hot Plant augmented the existing system and provided training capability for both high and low pressure systems at one location.[201]

Initial planning for the 1,200 PSI Hot Plant began in 1968. The project was given relatively low priority until October 1971, when the Chief of Naval Operations directed its acceleration. Following this, the Chief of Naval Material, the Naval Ship Systems Command and the Naval Facilities Engineering Command prepared a plan for accelerating the Hot Plant project.

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[200]DD-1391--MILCON Line Item: Propulsion Engineering Training Building, Naval Training Center, Great Lakes, Illinois.

[201]Ibid.

As the purpose of the 1,200 PSI Hot Plant training facility was to provide operational training ashore in 1,200 PSI operations and thereby improve the qualifications of personnel reporting aboard 1,200 PSI ships, the 1,200 PSI Hot Plant that was installed duplicated as closely as possible a modern shipboard steam plant--in this case, the DE 1052 propulsion plant.[202]

The two-story steel and concrete structure in which the Hot Plant was installed consisted of three major sections. The first section housed a school area which included classrooms and allied facilities required to conduct training activities. The second section contained the propulsion plant itself and the third section included a pump room to house tanks, pumps and a water cooling tower.

The Naval Ship Systems Command and the Naval Facilities Engineering Command assembled a single military construction package for the project: $14 million for the 1,200 PSI Hot Plant and $3.5 million for the buildings and related support facilities. The first contract to clear the ground and start foundations was awarded in February 1972 and was completed by May 1972. The second contract, which was funded by a combination of military construction and operations and maintenance funds was awarded in May 1972. This was for the installation of the 1,200 PSI propulsion unit, and for the classrooms and support facilities. The

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[202]"Management Plan for 1,200 PSI Hot Plant."

construction was usably completed by April 1975. The whole plant was scheduled for acceptance in July 1975, after testing by the contractor. Full scale training was to begin in October 1975.[203]

NAVAL AMMUNITION DEPOT, HAWTHORNE

An ammunition demilitarization facility at the Naval Ammunition Depot, Hawthorne, Nevada, was authorized for the fiscal year 1973 Military Construction Program. This project arose from two major considerations. The Environmental Protection Agency had in recent years banned the disposal of ammunition by dumping at sea, open burning and detonation. During the same period, interest increased in conserving our diminishing natural resources. The demilitarization facility at Hawthorne was designed to meet both the new limitations imposed by the Environmental Protection Agency as well as the demand to reuse obsolete material in order to conserve natural resources.[204]

The purpose of the demilitarization facility was to destroy the military potential of ammunition which had become obsolescent or unserviceable because of prolonged storage as well as of ammunition which had been found defective at some point during manufacture.

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[203]Goodwin interview.

[204]"Briefing on NAD Hawthorne, NV Demilitarization Facilities" (undated briefing), NAVFAC Construction, Code 051PH; Stevens interview.

After the start of facility design, the Naval Sea Systems Command requested that the Naval Facilities Engineering Command assume responsibility for the design, procurement and installation of the operating equipment, and thereby act as a single design and construction agent for the total facility.[205]

Subsequent to the enactment of the fiscal year 1973 authorization act, but prior to the start of construction, the Environmental Protection Agency rescinded its ban and again permitted ocean dumping, subject to restrictions. This resulted in a reevaluation of the demilitarization facility project which determined that it was still valid. In addition to saving the cost of ocean dumping (including procurement of a ship, transportation of material, its loading, and the towing and sinking of the ship, all of which is a total loss), the facility was expected to return to the government, over and above its operating costs, the following profit during the first three years of operations.[206]

| | |
|---|---|
| FY 1979 | $5.7 million |
| FY 1980 | $6.3 million |
| FY 1981 | $6.9 million |

The facility's designed capability would allow it to deal with all conventional naval ordnance from 30 caliber through 16 inch projectiles, all bombs, mines and depth charges up to 3,000 lbs. net explosive weight, all Navy cluster weapons and rocket warheads,

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[205]"Briefing on NAD Hawthorne."

[206]Ibid.

grenades cartridge activated devices, demolition materials and pyrotechnics.[207]

The facility would consist of a number of buildings, each constructed to carry out a specific demilitarization function on ammunition of any caliber, type and size. Eight structures in all were planned: an unloading dock, a preparation building, a mechanical removal building, a smokeless powder accumulator building, a steam/washout building, a bulk incinerator building, a refining building and a decontamination and small items furnace building. These structures will occupy about 150 acres (near Walker Lake) of the 153,656 acre Naval Ammunition Depot, Hawthorne, located approximately 130 miles east-southeast of Reno.[208]

Two construction contracts totaling $16.3 million were awarded to cover the first three phases of the project. One was awarded in August 1974, the other in April 1975. The estimated cost of the facility's operating equipment was estimated at approximately $10 million.

This was one of the biggest military construction projects of the 1974-1975 period. It involved a large amount of engineering research and design and will result in a facility that will perform a function hitherto unknown on such a large scale.[209]

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[207]"Briefing on NAD Hawthorne."

[208]Ibid.

[209]Ibid.

MEDICAL CONSTRUCTION

During the period 1965-1974, the Naval Facilities Engineering Command built a large number of military hospitals and related facilities. From 1972, this construction was accelerated under the Hospital Modernization Program.

During fiscal year 1964 a 500 bed hospital for Long Beach, California was authorized. This hospital cost $9 million and was completed in January 1967. In fiscal year 1965, a 400 bed hospital was authorized for Jacksonville, Florida. Construction began in January 1966 and was completed in December 1967. The cost was $7.4 million. In fiscal year 1965, there was a $14.5 million authorization for a 650 bed hospital in Oakland, California. Construction began in December 1965 and the hospital was completed by November 1968.[210]

In fiscal year 1966 a contract for a 200 bed addition to the Naval Hospital, Newport, Rhode Island, was programmed. The work was done in three phases. The contract for the first was awarded in September 1970, the second in April 1971 and the third in August 1973. The first two increments would be 100 percent complete by 1975 and the third 50 percent complete. The total cost of the project was $2 million.[211]

In 1967 a $6.6 million 230 bed hospital was authorized for Memphis, Tennessee. It was completed in fiscal year 1968. Also

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[210]Interview with Mr. W. M. Trow, NAVFAC Construction, Code 052PK, 22 May 1975.

[211]"Project Sheet--FY 1966 MCON/MCNR Program," NAVFAC Construction, Code 052PJ, Goodwin interview.

authorized that year was a unique 150 bed light-care dispensary for the Naval Training Center at Orlando, Florida. This clinic was unusual because of its size. It was designed to handle the type of minor injury and illness cases that were generated by naval training centers. These were cases that did not warrant anything as drastic as full hospitalization, and the consequent loss in training time involved in full hospitalization. The contract for this clinic was awarded in July 1969 and construction was completed in March 1971. This project cost $2.5 million.[212]

During that same year a hospital was programmed for the Naval Submarine Medical Center, New London, Connecticut. The award was made in two phases, May 1968 and May 1971. The work would be completed by 1975. Total cost was $11.2 million. Another hospital was programmed for Roosevelt Roads, Puerto Rico. The cost was $7.7 million. The award was made in February 1970 and the hospital was subsequently completed.[213]

During fiscal year 1968, the Command built a completely self-contained fifteen bed hospital on Adak Island. The contract was awarded in May 1969 and construction was completed in November 1970. The cost was $3 million.

Also constructed that year was another light-care dispensary, similar to the one programmed for Orlando, Florida in fiscal year

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[212]Trow interview.

[213]"Project Sheet--FY 1969 MCON/MCNR Program," NAVFAC Construction, Code 052PK.

1967. This dispensary was built at Paris Island, South Carolina. It was an eighty-three bed hospital and cost approximately $1 million. The contract was awarded in June 1969 and construction was completed in July 1970.

During fiscal year 1969 construction of a 500 bed hospital was begun in Charleston, South Carolina. The contract was awarded in February 1970, and construction was completed in January 1973. The cost was $16 million.

During fiscal year 1970, a naval hospital was built on Guam, Pacific Trust Territory. The contract was awarded in December 1969. The project was completed by 1975 at a total cost of $1.4 million.[214]

In fiscal year 1971, a dispensary with operating capability was undertaken at the Naval Station, Keflavik, Iceland. The contract was awarded in January 1971. Construction was completed at a cost of $6.2 million.[215]

A 195 bed hospital was built in Corpus Christi, Texas. The contract was awarded in April 1971 and construction was completed in April 1973. The cost was $10 million. That same year work began on a 600 bed hospital at Camp Pendleton, California. Construction started in April 1971 and was completed in November 1974. The cost was $23.5 million. During fiscal year 1972, a contract

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[214]"Project Sheet--FY 1970 MCON/MCNR Program," NAVFAC Construction, Code 052PK.

[215]Ibid.

was awarded for a 220 bed addition to the Naval Hospital, Long Beach. This work also included alterations to the old hospital. The work was to be completed in February 1975 and cost $15 million. That same year, a 310 bed hospital was started at Pensacola, Florida. Construction began in December 1972 and the estimated completion date was December 1975. The cost was $17 million.

At Great Lakes, Illinois, contracts for a Naval Hospital Corps School were awarded in January 1972 and October 1972 (two phases) at a total cost of $5.8 million. The school was largely complete by the end of 1974.[216]

During fiscal year 1973, the Command began constructing a new 100 bed hospital in New Orleans. Construction began in August 1974 and completion of construction was estimated for July or September of 1976. During fiscal year 1974 a 150 bed nursing unit addition was programmed for this hospital. The total cost for the entire facility was $21 million.[217]

In fiscal year 1974, a dispensary-dental clinic combination was begun at Chase Field, Texas. This was a completely self-contained unit and was equipped with obstetrics and nursing facilities. Construction began in September 1974. The estimated date of completion was February 1976 and the cost was $25 million. That same year, a dispensary was programmed for the Marine Corps Recruit Depot, San Diego. This dispensary was a seventy-five bed light

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[216]"Project Sheet--FY 1971 MCON/MCNR Program," NAVFAC Construction, Code 052PK.

[217]Trow interview.

care facility similar in purpose to those built at Orlando, Florida and Paris Island, South Carolina. Bidding opened in April 1975 and the proposed completion date was 1977. The cost was $3 million.

In addition to the major projects described above, there were numerous minor projects carried out under the Hospital Modernization Program. These involved the construction of dispensaries of all sizes and alterations to existing hospitals and dispensaries. The following chart gives a detailed accounting of the total number of projects and money spent on all projects for each fiscal year.

CHART 10-11 MEDICAL PROJECTS FOR FISCAL YEARS 1965-1975

| FY | Number of Projects that FY | Amount |
|---|---|---|
| 1965 | 12 | $26,045,000 |
| 1966 | 5 | 3,815,000 |
| 1967 | 4 | 11,348,000 |
| 1968 | 5 | 6,228,000 |
| 1969 | 5 | 26,582,000 |
| 1970 | 2 | 24,174,000 |
| 1971 | 2 | 2,327,000 |
| 1972 | 5 | 21,423,000 |
| 1973 | 5 | 39,991,000 |
| 1974 | 11 | 24,737,000 |
| 1975 | 15 | 45,599,000 |
| TOTALS | 70 | $232,369,000 |

HOSPITAL MODERNIZATION PROGRAM

Prior to 1972, in the realm of hospital modernization, it had been the Navy's policy to replace one of its hospitals each fiscal year. In early 1972, the Assistant Secretary of Defense (Health and

Environment) decided that this rate of replacement was far too low. He decided that the replacement program should be completed in only five years, beginning in fiscal year 1974. He ordered that a plan for accomplishing this goal be ready by 31 May 1972. The Navy, working through the Naval Facilities Engineering Command and the Bureau of Medicine and Surgery,[218] proposed and submitted a plan by that date, whereby all outdated facilities would be replaced during the fiscal years 1974-1979 military construction programs. The total cost would be in excess of $800 million.[219]

Because the program got off to a slow start (only $50 million was programmed in fiscal year 1974), and because of site problems and the magnitude of the construction projects involved, the original five year schedule had to be extended to fiscal year 1980. If appropriations decrease in size, the schedule may again have to be readjusted. The program emphasized modernization of old facilities over new construction. The policy of consolidation and regionalization was also a key factor in shaping the program. This policy called for a single hospital to serve all the armed forces personnel in a given region. In one area this might be a Navy hospital, in another, an Army hospital. In areas where more than one branch of the service operated a hospital, one would be modernized and enlarged so that it would be capable of servicing the entire

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[218]Interview with Mr. C. A. O'Connor, NAVFAC Construction, Code 052D, 29 May 1975.

[219]Ibid.

region. The other hospitals would be closed. As is apparent, such consolidation is far more economical since it eliminates needless duplication of facilities.[220]

CHART 10-12 HOSPITAL MODERNIZATION
PROPOSED MILITARY CONSTRUCTION FUNDING

| FY | $ (million) |
|---|---|
| 1974 | $ 50 |
| 1975 | 80 |
| 1976 | 133 |
| 1977 | 141* |
| 1978 | 173 |
| 1979 | 100** |
| 1980 | 100** |

*If funding approved, all Second World War cantonment type facilities will have been replaced by this year's program.

**Estimated.

SANGUINE/SEAFARER

An important communications development during the period under consideration was extremely low frequency radio (ELF). Extremely low frequency radio utilizes forty-five to seventy-five hertz waves which can be detected almost everywhere on the earth and to a considerable depth at sea. The Navy began research and development on extremely low frequency broadcasting in 1960. The problem with this type of

[220]O'Connor interview.

broadcasting was that a gigantic antenna was required. Such an antenna would represent a prodigeous construction feat. The Naval Facilities Engineering Command would naturally be responsible for such construction. The code-name for the Navy's extremely low frequency broadcasting project was "Sanguine." Sanguine was to consist of a "hardened" grid antenna system approximately forty to eighty miles square. The antenna would be buried and the transmitter stations (one at each intersection in the grid) would also be subsurface so that they could withstand attack. Such an installation would allow the broadcasting of virtually unjammable radio waves, each about 2,500 miles long. These would fill the space between the ionosphere and the earth's surface and would penetrate sea water to a considerable depth. Deep running submarines trailing special receiving antennas could be in constant communication with their headquarters thus long-range strategic weapons would be even more finely controlled. Because of the low conductivity of their soils, central Texas and northern Michigan have been tentatively selected as sites for one or more of the antenna complexes.[221] Thus far the Naval Facilities Engineering Command's major involvement in this project has been in the area of data collection for site selection. The Command built a test facility in Wisconsin to determine whether the system would work and whether the system would adversely affect the environment. The test site consisted of two antennas, each twenty-five miles long in the form of a cross.

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[221]Luzum and Jackson interview.

A transmitter building was constructed at their intersection.[222] Operations at the test site proved that the system would indeed function as planned and that it had no significant adverse affect on the environment.[223]

During fiscal year 1975, project Sanguine took a new direction. It was decided not to harden the transmitting facilities, but to build them on the surface. Only the antenna itself would be buried. Because of this change, Sanguine's name was changed to "Seafarer." Building the transmitter stations on the surface would mean a substantial reduction in the total cost of the project, bringing it down to an estimated $200 million. Of this sum, $46 million was programmed for the fiscal year 1978 Military Construction Program.

UNIFORMED SERVICES UNIVERSITY OF THE HEALTH SCIENCES (USUHS)/ REDEVELOPMENT OF NATIONAL NAVAL MEDICAL CENTER (NNMC), BETHESDA, MARYLAND

During the late 1960s, and especially after the discontinuation of the draft, the armed forces began to suffer from a shortage of physicians. Although part of a general nationwide physician shortage, the armed forces' physician problem was further aggravated by the fact that military physicians earned substantially less than their civilian counterparts. This pay disparity offered physicians a strong incentive either to leave the service or not to enter.

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[222] Luzum and Jackson interview.

[223] Ibid.

To solve this problem, the Department of Defense requested authorization to build its own medical school and train doctors at government expense, with the provision that they subsequently serve a stipulated number of years with the armed forces to defray the cost of their education.

Public Law 92-426, enacted 21 September 1972, directed that a Uniformed Services University of the Health Sciences (USUHS) be constructed within a twenty-five mile radius of the District of Columbia, and that it be organized to graduate a minimum of 100 medical students per year, with the first full-size class graduating not later than 1982. The National Naval Medical Center (NNMC) at Bethesda, Maryland was selected as the site for the university.[224]

The Naval Facilities Engineering Command was designated as construction agent for the university. Responsibilities of the designated construction agent included the planning, design and construction of all facilities for the university, which had to be planned and constructed concurrently with the Navy's Military Construction Program for modernization of facilities at the National Naval Medical Center. The complexity, magnitude and urgency of construction completion, and the coordination required to plan,

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[224] Program Execution Plan for National Naval Medical Center (NNMC) and Uniformed Services University of the Health Sciences (USUHS) Facilities (OICC Bethesda Instruction 5200.1 of 18 Feb 1975), p. 2; Interview with Mr. M. B. Simpson, NAVFAC Construction, Code 091B, 27 May 1975.

design and construct the facilities for the USUHS and the NNMC required management effort vested in a single organization.

As a result of this need, in January 1974, a new organization, the NNMC/USUHS Construction Program Office (PC-7) was established at Naval Facilities Engineering Command Headquarters to commence management of the hospital modernization and university construction programs at NNMC, Bethesda. On 14 June 1974, OPNAV Notice 5450 established the Officer in Charge of Construction, Bethesda (OICC Bethesda) as a field activity of the Command.

For planning purposes, the project was divided into two major aspects; the construction of the new medical university and the modernization of the existing medical center. Fiscal year 1975 saw construction getting underway. Medical university construction was scheduled to be done over four fiscal years (1975-1978) at a total cost of $138.6 million while medical center modernization was to be completed in five fiscal years (1975-1979) at a total cost of $188.6 million.

Construction of USUHS is planned for phasing in four increments as follows:

| | |
|---|---|
| Increment I<br>FY 1975 - $15.3 million | An interim facility and first increment to accommodate the academic curriculum for medical students through the 1976-1977 academic year. |
| Increment II<br>FY 1976 - $64.9 million | Continuation of the medical school of the university except for portions of the basic/clinical science office and research space for the facility. Also |

| | |
|---|---|
| | included are supporting facilities, conversion of certain Increment I spaces, and development of underground parking. |
| Increment III<br>FY 1977 - $9.9 million | Basic/clinical science office and faculty research space with associated supporting facilities. |
| Increment IV<br>(Unprogrammed - $48.5 million) | University schools of Dentistry, Pharmacy, Nursing, Veterinary Medicine, Allied Health and Graduate/Continuing Education. |

The other major project for OICC Bethesda was the modernization of the National Naval Medical Center. The existing thirty-five year old hospital was obsolete and did not meet current fire/life safety standards, nor could it accommodate the increased student teaching load associated with the University.

Included in the modernization project was construction of a new hospital, emergency vehicle shelter and two parking structures as well as rehabilitation of existing medical facilities and conversion of existing facilities for administrative functions. The completed project will provide a modern 750 bed hospital and a capability to accommodate 700,000 out-patient visits per year. Modernization of NNMC is planned in four phases as follows:

| | |
|---|---|
| Phase I<br>FY 1975 - $14.9 million | Includes construction of a medical warehouse, a 780 car parking structure, fire protection in the existing hospital, additional public works shops spaces and related utilities and road work. |

| | |
|---|---|
| Phase II<br>FY 1976 - $100.0 million | Construction of a new hospital and supporting facilities. |
| FY 1977 - $2.8 million | Construction of physical fitness facilities. |
| Phase III<br>FY 1978 - $25.9 million | Rehabilitation of existing medical spaces, construction of a second parking structure and supporting facilities |
| Phase IV<br>FY 1979 - $45.0 million | Rehabilitation of existing spaces and conversion of existing medical spaces into administrative spaces. |

Due to the close proximity of the medical center and university to each other and the large-scale common utilization of support facilities such as clubs, exchanges, and utility and road systems; planning, design and construction of both facilities requires extremely close coordination. When completed in 1981, the total complex will provide the Department of Defense with a complete teaching and practicing medical facility.

TRIDENT

One of the Naval Facilities Engineering Command's most important projects in 1974 was the construction of a base facility for the new sea-based missile defense system known as Trident. This system, comprising a new missile, a new missile carrying submarine, and the necessary supporting base facilities, was one of the largest projects ever undertaken by the Navy. The Naval Facilities Engineering Command was assigned complete responsibility for the development and construction of the base facilities complex.

Consideration of the Trident Missile System began in 1966. Later during the period 1968-1971 important long-range studies on the nation's defense were carried out. Their purpose was to determine which systems of strategic weapons were to get highest priority. The Trident Missile System emerged as a front-runner among the various competing weapon systems and it was thus decided to proceed with its development.

The Trident System, an advanced submarine-based weapon system, was to provide the capability of operating at sea for extended periods of time as a highly serviceable and reliable deterrent to first-strike actions by hostile forces. The submarine was to provide a platform for launching strategic missiles against enemy targets. In 1974, the program was structured to construct ten submarines that would become operational in the early 1980s and ultimately replace the existing Polaris systems.[225]

The submarine was designed to minimize the enemy's capability to locate and neutralize it. The ship was also designed for ease of maintenance and operation with rotating equipment pools to decrease the refit turnaround time. Thus the availability of the ship for duty was increased. The ship's design flexibility allowed for modification as improvements were developed through future engineering changes and breakthrough in weapon systems design.

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[225] Final Master Plan: Trident Support Site, Bangor, Washington (Jan 1975), pp. 1-2.

Trident ship patrols were to be of longer duration than previously possible and were to be followed by shorter refit cycles for maintenance and supply.[226]

The initial Trident missile was designed with dimensions similar to the Poseidon missile to allow it to be carried in existing Poseidon submarines. An improved propellant and control system was to give the Trident missile a much greater range than the Poseidon missile. The missile was also to carry a multiple independently-targeted reentry vehicle similar to that of Poseidon. To take advantage of advanced technologies currently under development in missile systems, the submarine was designed to receive at some future date, larger missiles with improved capabilities.[227]

Due to the increased range of the Trident missile, it was possible to establish the support facility for the Trident submarine force at a continental United States port. This would increase the effectiveness of the system's operation while maintaining alert status in port. Logistical support could be optimized since the ship would be able to dock in a continental United States port for refit, crew training and supply. It was for the construction of this support site that the Command was given total responsibility. In February 1973 a site was selected for this facility, the Bangor Annex of the Naval Torpedo Station, Keyport, Washington.

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[226] Final Master Plan: Trident Support Site.

[227] Ibid.

Prior to the selection of the Bangor Annex, the Navy conducted extensive site studies which included an analysis of virtually every potential site for Trident in the continental United States. The process began in September 1970 and involved a qualitative/quantitative analysis of eighty-nine locational alternatives. Bangor was finally chosen.[228]

The Trident support site was to be located on Kitsap Peninsula on Puget Sound, due west of Seattle, Washington. The site area was within the boundaries of the existing Bangor Annex, Naval Torpedo Station, Keyport. The site was rural in nature; the nearest urban areas were Silverdale, Poulsbo, and Keyport with approximate populations of 1,800, 2,400 and 500 respectively. The greater Seattle metropolitan area with a population of approximately 500,000 was about a one-half hour drive by road plus about a one-half hour ferry ride aboard the Seattle-Winslow ferry.

The cost of the Trident system was estimated at $15 billion. Of this, the support site was going to cost approximately $650 million. Because of the magnitude and importance of the project, the Command established an Officer in Charge of Construction for Trident in 1972. While he and his staff were located at Command Headquarters in Alexandria, a Deputy Officer in Charge of Construction, tasked with design and construction, was actually located at Bangor. The project was put under its own Officer in Charge of

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[228]Final Master Plan: Trident Support Site.

Construction to allow more freedom of action in construction. In addition, a single appropriation was made each year for the entire project, rather than for each line item comprising the project. Such freedom of action was necessary if the support site was to meet the April 1979 deadline for initial operational capability.[229]

The master plan contract was awarded in June 1973, and the architectural and engineering contracts in July. In October 1974, the first construction contract was awarded, a $1.5 million first increment of a $30 million, 300,000 square foot training building.[230]

As the purpose of Trident was to provide a sea-based strategic deterrent system with increased survivability, reliability and availability over existing fleet ballistic missile systems, special maintenance and logistic support facilities were needed to accommodate the mission on a full-time basis. The Trident support site at the Bangor Annex was designed to permit Trident to meet these needs.

The site was to have four major mission functions: (1) submarine refit, (2) missile support, (3) site support and (4) personnel training. Refit would include resupply, maintenance and repair operations on the submarines. The refit facilities were to include shops, storage, staging, and a management center. A

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[229]Interview with Mr. R. J. Lanoue, OICC Trident, Code OT-21, 23 May 1975.

[230]Ibid.

dry dock and two refit berths were to be located at the waterfront. Missile support was to be the responsibility of the Strategic Weapons Facility, Pacific (SWFPAC). The installations for this support included explosive handling wharves, storage facilities for missiles, and production and assembly facilities. These facilities were to be similar in function to the existing Polaris missile facilities but considerably more extensive and sophisticated. The Trident Support Site (designated the Submarine Base, Bangor) would provide logistic support, which would include the necessary physical security, administration, public works, housing and other community and public support services and facilities required to maintain the site. Finally the training facility, was to provide basic courses and refresher training for personnel to develop and maintain professional skills necessary for operation of the system.[231]

The site itself can be divided into the northern sector and the southern sector for descriptive purposes. The northern sector was to contain all of the facilities requiring an explosive rating generated by the weapons system and facilities. The following facilities were to be included in this area: magazines, missile assembly and check-out buildings, engineering and technical support buildings, warehouses, refit industrial facilities, refit piers, service pier, drydock, magnetic silencing facility, explosive handling wharves.

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[231] Final Master Plans: Trident Support Site, pp. 3-24ff.

The southern section was that land area which fell completely outside of the quantity-distance safety areas and contained the Trident support facilities and the training facility, and the southeast and west family housing areas (proposed total of 1,400 units).

The dry dock, refit berths, explosive handling wharves, service pier, magnetic silencing facility and certain associated facilities by reason of their function were to be located at the waterfront. The existing marginal wharf already occupied a position approximately midway between the north and south boundaries of the waterfront area. This meant that the new facilities had to be located either north or south of this pier. It was decided to locate the dry docks south of the marginal pier and the explosive handling wharves, service pier and magnetic silencing facility to the north.[232]

This project was still in its initial stages in 1974. The following years should see construction of a magnitude unprecedented since the Vietnamese War at the Bangor Support site.

ATLANTIC FLEET WEAPONS RANGE

In the early 1970s, controversy arose over the Navy's use of the northwest peninsula of the island of Culebra, Commonwealth of Puerto Rico, as a gunnery, rocket and bombing range. At that time

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[232] Final Master Plans: Trident Support Site, Figure 6-1, pp. 3-24.

there was a movement to develop the island as a resort center, and it was felt that the Navy's firing range would have to be closed down before this could successfully be accomplished. Pressure was generated in Congress and legislation was passed which ordered the Navy to cease fire at Culebra on 1 July 1975. The Navy was ordered to relocate its firing range to a more suitable site.

On 20 November 1974, Congress appropriated $12 million for the relocation construction. The Command, working in conjunction with the other systems commands involved in this change, was given the responsibility for finding a new location and for building the necessary shore facilities.

The relocation of gunnery and bombing operations from the northwest peninsula of Culebra was expressly conditioned upon the conclusion of a satisfactory agreement which was to be negotiated by the Secretary of the Navy with the Commonwealth of Puerto Rico. Among other things this agreement was to provide that the commonwealth would insure that lands suitable for carrying out practice operations of the type carried out on Culebra would be made available for the long continued use of the Atlantic Fleet Weapons Range. In addition, any proposed facility or activity which would interfere with the Navy's training mission at its new location was not to be undertaken.[233]

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[233]PL 166, 93rd Cong. Act of 29 Nov 1973, p. 8.

The Command studied several sites where it could relocate its firing range. Islands off both the east and west coast of Puerto Rico were considered but no completely suitable site had been found by the end of 1974. What was specifically needed was an inhabited site off the main shipping lanes. Inhabitants were a desirable feature since they would supply the Navy with a local labor force to build and staff the firing range's support facilities. It would be extremely costly to develop a completely uninhabited site.[234]

## INTERAGENCY CONSTRUCTION

The Naval Facilities Engineering Command's efforts during the years under study, were directed not only at implementing construction funded from the Navy Military Construction Program, but also at executing certain general categories of construction which were ultimately funded from other sources. One of these, interagency construction has already been touched upon in the discussion on the Command's Southeast Asia effort.

The Command's Interagency Construction Division handled all non-Navy funded, Navy and Marine Corps non-appropriated, and civil

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[234]Interview with Mr. R. C. Nordby, NAVFAC Construction, Code 052A, 27 May 1975.

works projects.[235] The total cost of interagency construction (less Southeast Asia) during the years 1965-1974 was between $100 and $150 million annually and involved an input of approximately 200 new projects each year.[236] The Command completed a number of significant interagency projects during the year 1965-1974. Among them was the civilian air terminal at the Naval Air Station, Agana, Guam. The sponsor was the Guamanian government. The project cost $1.6 million and was completed in June 1965.[237]

During the 1960s, the Command executed two projects for the Bureau of Commercial Fisheries. In 1965, the Command completed a laboratory at La Jolla, California, costing $2.2 million. It consisted of four, three-story concrete units built around a central core. Interchangeable, movable partitions allowed flexibility in the utilization of the 70,000 square foot area of this facility. The Command also built a Tropical Research Laboratory at Virginia Key, Florida for the bureau. Completed in the late 1960s, this project cost approximately $3 million.[238]

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[235]Civil works projects were projects at government owned, contractor operated industrial plants that were producing military hardware and weapon systems. The government made the capital investment for such work. During the period under consideration, civil works projects amounted to from $15 to $20 million annually while non-appropriated projects ran between $10 to $15 million annually.

[236]Interview with Mr. W. E. Douglas, Jr., NAVFAC Construction, Code 053A, 26 May 1975.

[237]"0532 Branch, Projects of Interest" (13 Dec 1968), NAVFAC Construction, Code 053A.

[238]Ibid.

There were many interagency projects completed in Southeast Asia during the Vietnamese conflict. Among these were the new embassy in Saigon, built for the State Department at a cost of $2.7 million and United States Military Assistance Command Headquarters, built for the Army at a cost of $28 million.[239]

In June 1968, the Command completed construction of the Pacific War Memorial at Corregidor, Philippines for the Corregidor-Bataan Memorial Commission and the Veterans Administration. The cost was $1.3 million.[240]

More recent projects included the USS Utah Memorial. Interested parties during the period 1970-1971 pushed for the creation of a memorial to the USS Utah, sunk at Pearl Harbor on 7 December 1941. A public subscription campaign was initiated to help raise money for this project and in 1971 and 1972 Congress appropriated military construction funds to augment the funds raised by public subscription. The Command handled the design and construction. (Design was done in-house by the Officer in Charge of Construction, Mid-Pacific.) Cost of the project was $160,000. The memorial was dedicated on Pearl Harbor Day 1972.[241]

Beginning during the summer of 1972, the Command carried out the design concept work for a new generation of military hospitals.

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[239]"0532 Branch, Projects of Interest;" Both of these projects are mentioned in the section on Vietnam construction.

[240]Douglas interview.

[241]Ibid.

The prototype was to be built at Travis Air Force Base with the Air Force as sponsor at an estimated cost of $140 million. The new hospitals were to be completely computerized and automated. Congress subsequently scrapped the construction of the prototype, but the engineering and development that had already gone into the project will prove useful in the design of other hospitals.[242]

The Naval Facilities Engineering Command was the construction agent for the Advance Airborne Command, at Andrews Air Force Base. This command maintained a fleet of Boeing 747s which served the Presidential Air Fleet, and provided an Airborne National Command Center in time of emergency. During the 1970s, the Naval Facilities Engineering Command built support facilities at Andrews Air Force Base. These were designed during the latter part of 1973 and were to be awarded during 1975. The contract was to be for approximately $20 million.[243]

NATIONAL AERONAUTICS AND SPACE AGENCY

During fiscal years 1965 to 1972, a number of construction projects were executed for the National Aeronautics and Space Agency. Among these projects were communication stations which formed part of a data acquisition network in support of earth orbital flights and moon missions. Approximately $25 million

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[242]Douglas interview.

[243]Ibid.

was spent on stations located at Ascension, Antigua (British West Indies), Spain, Corpus Christi, Canary Islands, Bermuda, Guam and Hawaii.

A larger project, Deepspace, was built in Spain during this period at a cost of approximately $6 million. Also in connection with the space program, the Command built a Saturn II manufacturing facility at Seal Beach, California at a cost of approximately $15 million.[244]

CHART 10-13 NASA PROJECTS

| Fiscal Year | Number of Projects | Cost |
|---|---|---|
| 1964 | 6 | $ 3,486,931 |
| 1965 | 23 | 11,221,870 |
| 1966 | 14 | 9,247,741 |
| 1967 | 4 | 98,648 |
| 1968 | 6 | 642,104 |
| 1969 | 7 | 62,298 |
| 1970 | 9 | 1,711,255 |
| 1971 | 8 | 236,800 |
| 1972 | 4 | 296,399 |
| Total | 81 | $27,004,046 |

[244]Jones interview; Ltr from COMNAVFAC to NASA of 8 Nov 1973, subj: Status of NASA Requisitions.

By fiscal year 1972 most projects for NASA had been accomplished. Only small projects involving modifications at already existing sites were still being executed.

## NAVAL RESERVE MILITARY CONSTRUCTION

A significant part of the Naval Facilities Engineering Command's effort during the period 1965-1974, was aimed at Naval Reserve facility support. The Command executed numerous construction Naval Reserve projects during the course of each fiscal year. Funding for these projects was not from naval military construction sources (Title II), but from a completely different funding category (Title VII), which funded reserve construction for all three services.[245]

The major difference between Navy military construction and Naval Reserve military construction was that the former was funded line item by line item and the latter by one lump sum for the entire year's program.

Lump sum funding was considered essential to reserve military construction programming because it allowed more planning flexibility than did line-item appropriation. Given the fluidity of the reserve program such flexibility was absolutely essential. Unlike regular Navy units, reserve units were subject to rapid

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[245]Interview with Mr. F.A. Peterlin, NAVFAC Construction, Code 052PF, 28 May 1975.

manpower changes. Because of this it was necessary to have the ability to cancel projects, shift funds to other projects or even create entirely new projects without recourse to congressional approval for each project.[246]

Most of the Command's Naval Reserve construction projects were small. Of the 238 projects authorized between fiscal year 1965 and 1975, only 76 had appropriations greater than $500,000 and of these, only 24 were in excess of a million dollars.[247]

CHART 10-14 NAVAL RESERVE MILITARY CONSTRUCTION

| Fiscal Year | Number of Projects | Funds Appropriated |
|---|---|---|
| 1965 | 25 | $ 7,000,000 |
| 1966 | 32 | 9,500,000 |
| 1967 | 11 | 5,400,000 |
| 1968 | 21 | 5,000,000 |
| 1969 | 17 | 5,000,000 |
| 1970 | 28 | 9,600,000 |
| 1971 | 9 | 5,000,000 |
| 1972 | 21 | 10,900,000 |
| 1973 | 18 | 20,500,000 |
| 1974 | 27 | 22,900,000 |
| 1975 | 19 | 20,000,000 |
| Total | 228 | $120,800,000 |

[246]Peterlin interview.

[247]Ibid.

FAMILY HOUSING CONSTRUCTION

During the past decade, the most exciting development in family housing construction was turn key construction. The turn key method of family housing construction resulted from years of searching for the best method by which the Navy might provide suitable family housing for its personnel. During the 1950s all the military services used conventional home contractors and conventional mortgage methods to build and finance required family housing. They did this because they assumed that those people, already skilled in private housing construction, would be the most efficient and economical.

Private housing contractors were used for family housing construction until the early 1960s when a contractor scandal on one of the government projects forced a reevaluation of this method. As a result of this scandal, which involved the theft of a considerable amount of mortgage money earmarked for construction financing, the Naval Facilities Engineering Command, as agent responsible for Navy family housing, put family housing into the Military Construction Program in 1962.[248] Under the new system, the same large construction contractors who carried out major construction projects for the Command also became responsible for family housing construction.

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[248]Interview with Mr. Y. P. Boswell, NAVFAC Construction, Code 052C, 28 May 1975.

In 1969, Congress decided that the Navy was not getting the best housing for the dollars expended under this system. According to Congress, the contractors involved, being large-scale military construction specialists, lacked expertise when it came to single dwelling construction. The Navy and the Command were tasked with developing a new, more efficient method for family housing construction. From this congressional imperative, the turn key concept of construction was developed.[249]

The Navy utilized the type of turn key construction known as one-step turn key. Under a one-step turn key contract, the Command provided regular private housing contractors with the performance specifications that the Navy wanted. The contractors then prepared schematic plans and estimated cost. The Command rated each contractor by a point system on several factors--quality of housing, cost, etc. The contractor with the most points got the contract. One-step turn key allowed the Command to utilize the smaller contractors with the most expertise in the building of single family dwellings, while at the same time maintaining control over the quality and cost of construction. Under this system the Command was able to get a high level of construction quality for the money it expended. This was an important factor since the Command was interested in obtaining good quality housing for Navy personnel and their families.[250]

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[249] Boswell interview.

[250] Ibid.

The first Navy turn key project was in the fiscal year 1966 Military Construction Program. It consisted of thirty-six units in Oak Knoll, California. Although begun in 1966, until fiscal year 1971 turn key construction accounted for only 15 percent of the Command's family housing construction. The remainder was handled as regular military construction through large defense contractors. From fiscal year 1971 onward, an increasing amount of Navy family housing construction was carried out under turn key contracts. By fiscal year 1975, over 75 percent of yearly family housing construction was turn key. The remainder could not be procured as turn key for a variety of reasons. Location was a factor. In isolated areas, lacking local housing contractors, other means had to be used. Many foreign nations required that housing be built by local labor under special contracting arrangements. Finally, small projects with less than 150 units could not be done under turn key, because the return would be too low to justify contractors developing the expensive design and bidding packages that were necessary.

CHART 10-15 NAVY FAMILY HOUSING

| Fiscal Year | Projects | Number of Units | $ Authorized | Turn Key |
|---|---|---|---|---|
| 1966 | 18 | 3,430 | $ 79,950 | 1 |
| 1967 | 0 | 0 | --- | 0 |
| 1968 | 27 | 3,120 | 93,810 | 6 |
| 1969 | 8 | 750 | 17,000 | 1 |
| 1970 | 11 | 1,540 | 47,517 | 4 |
| 1971 | 10 | 3,334 | 85,001 | 5 |
| 1972 | 15 | 3,808 | 107,146 | 7 |
| 1973 | 12 | 3,690 | 119,900 | 9 |
| 1974 | 10 | 3,150 | 109,397 | 6 |
| 1975 | 9 | 3,278 | 103,926 | 7 |
| Total | 120 | 26,100 | $763,649 | 46 |

CHART 10-16 TURN KEY HOUSING PROJECTS RESPONSE

| Fiscal Year | Project | Units | CWE | # Proposals and Locations of Firms |
|---|---|---|---|---|
| 1966 | East Bay, Oak Knoll, CA. | 36 | $ 740,000 | (6) 5 CA. - 1 TX. |
| 1968 | NSGA Winter Harbor, ME. | 32 | 770,000 | (5) 3 ME. - 1 N.H. - 1 MA. |
| 1968 | NC Boston, MA. | 100 | 2,015,000 | (4) 2 MA. - 1 N.Y. - 1 CT. |
| 1968 | NF Nantucket, MA. | 14 | 356,800 | (10) 9 MA. - 1 R.I. - 2 MA. |
| 1968 | NC Philadelphia, PA. | 100 | 2,016,000 | (7) 5 PA. - 1 OH. - 1 CT. |
| 1968 | NF Guantanamo Bay, Cuba | 150 | 4,267,000 | (2) 1 IL. - 1 N.J. |
| 1968 | N.W. Cape, Australia | 70 | 2,522,000 | (3) 1 WA. - 1 HI. - 1 CA. |
| 1969 | NAAS Fallon, NV. | 44 | 883,000 | (5) 3 NV. - 2 CA. |
| 1970 | NAS Lemoore, CA. | 190 | 3,800,000 | (6) 1 NV. - 5 CA. |
| 1970 | MCB Camp Pendleton, CA. | 102 | 2,318,000 | (5) 5 CA. |
| 1970 | NS Adak, AK. | 100 | 3,971,000 | (8) 6 WA. - 2 AK. |
| 1970 | NC Guam, M.I. | 200 | 5,687,000 | (8) 1 CA. - 1 WA. - 2 HI. - 4 Guam |
| 1971 | NC San Diego, CA. | 900 | 18,600,000 | (14) 10 CA.- 1 PA.- 1 TX.- 1 VA.-1 WA. |
| 1971 | NSB New London, CT. | 300 | 7,195,000 | (5) 2 MA. - 1 VA. - 1 KY. - 1 R.I. |
| 1971 | NTC Great Lakes, IL. | 150 | 3,862,000 | (5) 1 VA. - 2 IL. - 1 TN. - 1 WI. |
| 1971 | NS Guam, M.I. | 300 | 9,526,200 | (2) 2 Guam |
| 1971 | MCAS El Toro, CA. | 300 | 6,700,000 | (9) 6 CA. - 1 VA. - 1 TX. - 1 NV. |
| 1972 | NC San Diego, CA. | 600 | 14,100,000 | (8) 1 NV.-5 CA.-1 AZ.-1 WA. |
| 1972 | NAS Memphis, TN. | 100 | 2,340,000 | (8) 1 GA.-1 TX.-1 WI.-1 N.C.-1 LA.-3 TN. |

CHART 10-16 (continued) TURN KEY HOUSING PROJECTS RESPONSE

| Fiscal Year | Project | Units | CWE | # Proposals and Locations of Firms |
|---|---|---|---|---|
| 1972 | NC Warminster, PA. | 200 | $ 5,134,000 | (9) 5 PA. - 3 VA. - 2 IN. |
| 1972 | MCB Camp Pendleton, CA. | 200 | 4,930,000 | (11) 6 CA.-1 VA.-1 WA.-1 TX.-1 NV.-1 PA. |
| 1972 | NC Norfolk, VA. | 640 | 17,027,000 | (9)* |
| 1972 | NB Roosevelt Roads, P.R. | 250 | 8,350,000 | (7) |
| 1972 | NC East Bay, San Francisco, CA. | 154 | 4,655,000 | (5) |
| 1973 | MCB Camp Pendleton, CA. | 400 | 9,200,000 | (12) |
| 1973 | MCB Twentynine Palms, CA. | 100 | 2,380,000 | (12) |
| 1973 | NC Charleston, S.C. | 200 | 4,656,000 | (6) |
| 1973 | NC Guam, M.I. | 230 | 7,705,000 | (6) |
| 1973 | NAS Meridian, MS. | 200 | 4,518,000 | (5) |
| 1973 | NTC Orlando, FL. | 300 | 7,216,000 | (6) |
| 1973 | NC Gr. Lakes/Glenview, IL. | 210 | | |
| 1974 | MCB Camp Pendleton, CA. | 800 | 21,021,000 | (7) |
| 1974 | MCB Twentynine Palms, CA. | 200 | 5,330,000 | (7) |
| 1974 | NC Charleston, S.C. | 270 | 7,900,000 | (2) |
| 1974 | NC Philadelphia, PA. | 350 | 10,300,000 | (2) |
| 1974 | NC San Diego, CA. | 325 | 9,440,000 | (4) |
| 1974 | NC Guam, M.I. | 510 | | |
| 1974 | NS Mayport, FL. | 400 | | |

*Information not available at this time.

BACHELOR HOUSING

The Naval Facilities Engineering Command was not only responsible for Naval family housing construction, but also had cognizance over construction of Navy bachelor housing and messing facilities. During the period 1965-1974, the Department of Defense placed heavy emphasis on personnel retention, morale, and welfare. Because the habitability of quarters is a major morale determinant, a comprehensive review was undertaken in the early 1960s to ensure that all planned housing projects would provide the high standard of livability to which bachelor personnel are entitled. This extensive study was completed in 1965.[251]

By June 1965, final design neared completion on a fiscal year 1966 program for modernization and new construction of barracks for nearly 40,000 enlisted personnel spaces at an estimated cost of $57 million and for nearly 2,000 bachelor officer quarters personnel spaces at an estimated $7.5 million. A new concept in barracks design was implemented. It consisted of from one to four man rooms instead of open dormitory-type spaces. This design provided increased privacy and livability. The Command continued to participate in the development of tri-service criteria and definitive drawings for personnel support facilities.[252]

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[251] BUDOCKS Progress Report, (FY 1965), p. 15; NAVFAC Progress Report (FY 1966), p. 15.

[252] Ibid.

In September 1965, at the request of the Command, the Secretary of the Navy recommended to the Secretary of Defense that the statutory cost limitations for bachelor housing facilities be increased. As a result of this recommendation, the Chief of Naval Operations earmarked approximately 25 percent of each year's construction funds for the upgrading of the Navy's bachelor housing inventory to authorized criteria.[253]

In May 1966, the Assistant Secretary of Defense established a task force on bachelor accommodations. This task force subsequently submitted a report calling for improved criteria for bachelor housing. This report was based on previous tri-service proposals to which the Command had made a major contribution.[254]

The Vietnamese War dramatically affected bachelor housing. The rapid personnel increases during 1965, 1966 and 1967 compelled the Navy to greatly expand bachelor housing construction. The whole bachelor housing improvement program made significant strides during the late 1960s and early 1970s.

Even after United States participation in the war ended and troop levels were drastically reduced, bachelor housing construction continued at a steadily growing pace. A detailed examination of just the last three years of the period under consideration gives some idea of the scope of bachelor housing construction during the first half of the 1970s.

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[253] NAVFAC Progress Report (FY 1966), p. 15.

[254] Ibid.

During fiscal year 1972, no less than $87.2 million was authorized for fifty bachelor enlisted housing projects and $14.7 million for ten bachelor officer housing projects. Of these sixty projects, only three were subsequently cancelled.[255]

The following year even more funds were allocated for bachelor housing construction. Some $95.2 million was authorized for forty-one enlisted projects and $7.5 million for six officer projects. Of these forty-seven projects, six were subsequently cancelled.[256]

Fiscal years 1974 and 1975 saw lower allocations, about $90 and $80 million respectively, authorized for bachelor housing construction. Despite these slight decreases, it was apparent that bachelor housing had made great strides, both quantitatively and qualitatively during the period under consideration. Not only had money for the total program steadily increased over the past decade, but also the amount of money that could be spent on each personnel space had also dramatically increased.[257]

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[255]"FY 1972 MCON Bachelor Enlisted Quarters;" "FY 1972 MCON Bachelor Officer Quarters," NAVFAC Construction, Code 052B.

[256]"Fiscal Year 1973 Bachelor Enlisted Men's Program;" FY 1973 MCON Bachelor Officer Quarters," NAVFAC Construction, Code 052B.

[257]"Navy and Marine Corps FY 1974 Military Construction Program Housing and Community Facilities;" "Navy and Marine Corps FY 1975 Military Construction Program Housing and Messing Facilities," NAVFAC Construction, Code 052B.

CHART 10-17 HISTORY OF STATUTORY LIMITATIONS FOR BACHELOR HOUSING

| Public Law | Fiscal Year | Date Approved | Barracks $ (million) | BOQ $ (million) |
|---|---|---|---|---|
| 85-695 | 1959 | 20 Aug 1958 | 1.9 | 8.5* |
| 89-568 | 1967 | 12 Sep 1966 | 2.3 | 8.5 |
| 90-110 | 1968 | 21 Oct 1967 | 2.3 | 8.5 |
| 90-408 | 1969 | 21 Jul 1968 | 2.5 | 9.2 |
| 91-142 | 1970 | 5 Dec 1969 | 2.8 XACF** | 10.0 XACF |
| 91-511 | 1971 | 26 Oct 1970 | 3.2 XACF | 11.0 XACF |
| 92-145 | 1972 | 27 Oct 1971 | do... | do... |
| 92-545 | 1973 | 25 Oct 1972 | $27.00/SF XACF | $29.00/SF XACF |
| 93-166 | 1974 | 29 Nov 1970 | 28.50/SF XACF | 30.50/SF XACF |
| 93-522 | 1975 | 27 Dec 1974 | 31.00/SF SACF | 33.00/SF XACF |

*OSD in 1961 established administrative limit of $7,000 to become effective with the FY 1963 Program. On 29 Nov 1966 OSD waived admin. limit and authorized $2,300 and $8,500 to apply to all unstarted FY 1967 and prior.

**XACF stands for "Times Area Cost Factor." As construction costs varied from area to area, this factor was henceforth taken into account when computing expenditure.

COLLATERAL EQUIPMENT

During the period 1965-1974, the Defense Department's concern with the quality of military living conditions not only influenced the family and bachelor housing construction program, but also affected the furnishing of the facilities built by these programs. Before May 1965, there was no uniformity in the initial outfitting of living quarters. Although the Naval Facilities Engineering Command was total facilities manager for the Navy, local commanding

officers had final discretion in the furnishing of their newly constructed bachelor enlisted and bachelor officers quarters. Because of this discretion the living quality of such quarters varied greatly.[258]

To remedy the situation, on 3 May 1965, the Command was made responsible for outfitting all military construction and reserve military construction program personnel support facilities.[259] The Command was also tasked with upgrading personnel support equipment at all existing Navy facilities, and given responsibility for personnel support equipment at all Naval Material Command activities.[260]

This mandate was reinforced and expanded on 13 July 1968 when the Command was made responsible for the initial outfitting of military and military reserve construction with non-technical equipment (excepting Navy Industrial Fund activities, ships, ordnance, naval air rework facilities and avionics). When it came to the installation of technical collateral equipment, the Command was mandated to coordinate the timing and outfitting with the sponsor supplying the equipment.[261]

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[258]Interview with Mr. W. E. Henley, NAVFAC Construction, Code 05E, 27 May 1975.

[259]SECNAV Instruction 7042.10 of 3 May 1965.

[260]Ibid.

[261]SECNAV Instruction 7040.7 of 13 Jul 1968.

On 4 March 1971, further steps were taken to upgrade the quality of personnel living quarters. Uniform requirement procedures were established as well as guidelines for repair, replacement and disposal.[262]

DISASTER RELIEF

During the period 1965-1975 the Naval Facilities Engineering Command, at the request of the Office of Emergency Preparedness, participated in several rebuilding projects following national disasters.

Public Law 606, 91st Congress as amended, (called the Disaster Relief Act of 1970) revised and broadened the scope of the existing major disaster relief program.[263]

Executive Order 11575 designated these functions to the Office of Emergency Preparedness (OEP) in the executive office of the president. This law (91-606) and its implementing Executive Order updated and suspended Public Law 875, 91st Congress (called the Federal Disaster Act of 1950).

Public Law 606, 91st Congress gave the president broad powers to provide Federal assistance to supplement the efforts and

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[262]OPNAV Instruction 11101.32 of 4 Mar 1971.

[263]Interview with Mr. W. Gill, NAVFAC Construction, Code 053PW, 29 May 1975; Memo from NAVFAC Hqs. Code 0531 to Code 053A (undated), subj: Trust Territories Construction, Office of Emergency Preparedness.

resources of the states and local governments in providing emergency relief and reconstruction of public facilities damaged by major natural disasters. Under this law the president could direct the various federal agencies and departments, including the Department of Defense, to provide such services, with or without recompense.

As it touches the Naval Facilities Engineering Command the main thrust of this authority, i.e. to direct and proceed with or without recompense, meant that the Command should act immediately and worry about reimbursement later. Command Headquarters issued a Military Construction Reimbursable Project immediately upon hearing of a declaration by the president of a major disaster and receipt of an order from Office of Emergency Preparedness. In no case has the Command ever failed to be reimbursed. As a Department of Defense construction agent, the Navy was responsible for disaster relief in Alaska as well as in the Trust Territories, Guam and certain other areas in the Pacific. Since 1962 the Navy has provided disaster assistance amounting to a total of $26.9 million.[264]

Not included in this amount were funds in the amount of approximately $9.6 million provided by the governments of Guam

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[264]Gill interview; Memo from Code 0531 to Code 053A.

CHART 10-18 DISASTER RELIEF

| Date | Disaster | Location | Amount |
|---|---|---|---|
| 1962 | Typhoons, Karen & Olive | Guam | $13,843,000 |
| 1964 | Kodiak Earthquade | Alaska | 2,500,000 |
| 1967 | Typhoon Sally | Palau Islands | 1,583,000 |
| 1968 | Typhoon Jean | Saipan | 6,000,000 |
| 1971 | Typhoon Amy | Truk District | |
| | | a. Procurement of Materials | 1,500,000 |
| | | b. Reconstruction of Public Facilities | 1,491,000 |
| Total | | | $26,917,000 |

and the Trust Territories to supplement Office of Emergency preparedness relief funds, to procure materials and/or build new facilities, rather than reconstruct to minimum essential standards as provided under the public law.[265]

[265]Gill interview; Memo from Code 0531 to Code 053A.